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Teacher's Guide

Secondary Geography for Pakistan

for Grade 7

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Published in Pakistan by
Oxford University Press
No.38, Sector 15, Korangi Industrial Area,
PO Box 8214, Karachi-74900, Pakistan

E-book First Edition published in 2023

ISBN 9789697346325

Acknowledgement
Illustration: p. 38: Greengate Publishing Services and OUP

Introduction

The lesson plans here are based on suggestions of how to cover the curriculum over 18 weeks of Geography teaching during school year 6, with three or four lessons per week of 40 or 45 minutes each.

Each plan consists of the following headings and information

Chapter

Textbook chapter number and section

Lesson

Number in sequence

Textbook Section

The part of the textbook to be used for this lesson

Aim

The overall objective or enquiry question for the session

Learning outcomes

The specific areas of skills and content to be covered

Lesson plans

Ideas for the stages of the lesson- usually consisting of a preview or starter activity to catch pupil's interest; an explanation of new knowledge and suggested activities.

Plenary

Advice for drawing together the end of the lesson and reviewing what has been learnt to consolidate understanding.

Responses to questions at the end of the chapter

A guide of potential responses to exercises at the end of each chapter in the book

Opportunities for Longer Prose Responses, Debating and Extended Writing

Ideas for extended learning activities to engage students in critical thinking and enhance deeper understanding, communication skills, self-awareness and meta cognition

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Chapter 01

Plains and Rivers

This chapter is about plains and rivers as key geographical features, and how they operate as landforms and habitats

Textbook Section: Pages 1-10

Aim: To develop an understanding of plains and rivers and their importance..

Learning outcomes of the chapter:
Learners will—

- Describe the nature of plains as a landform and habitat;
- Give examples of their differing nature due to climate influences;
- Explain how rivers shape landscape;
- Use specialist terminology to describe geographical processes;
- Evaluate the importance of rivers to the ecosystem and economy.

Lessons 1-3 What are Plains and where do we find them?

Textbook section: Section 1.1, Pages 2 and 3

Aim: To develop an understanding of the types and nature of plains.

Learning outcomes: learners will-

- Be able to distinguish between structural, erosional and depositional plains and state where examples can be found in Pakistan;
- Explain the terms abyssal and alluvial plains and show how cold, very dry, hot, semi-arid, dry, temperate, and tropical grassland or savannah plains differ.

Lesson 1 Plains and their features

In your preview you could explain that today we are going to work to understand the specialist language associated with, and processes that describe plains. Try holding out one hand flat, so that it makes a surface that the children can see. Talk about the definition of a plain, as a flat expanse of land. With the group read the first part of Section 1.1 of the textbook: the section 'What is a plain?' at the top of page 2.

One by one, read the three processes that create plains (text along the left hand panel on page 2, and hold your hand or hands out for each one to play the plains game:

During the explanation of Structural plains, hold both hands out in front of you and drop or raise one to represent how the adjoining land rises or falls due to tectonic action and creates the plain.

For Erosional Plains, run your fingertips along the top of the outstretched hand to represent the friction and abrasion that creates the eroded flat surface.

For Depositional Plains, use fingers of the hand that is not outstretched to make it look like you are dropping salt or spices into a cooking pot to show the action of matter being gradually added to a surface. Explain that

there are three types of depositional plain: abyssal (use the fingers on your free hand to represent water – keep the hand well above the 'plain hand' to represent deep water); alluvial (use the same wiggling fingers, but not as high above the plain); and flood (have the fingers just lapping against the edge of the 'plain hand' and occasionally just over the surface).

Then ask children to join you and repeat the actions, showing the three processes in a kinaesthetic way.

Once you have talked then through the material a couple of times try just showing the hand gesture in random order: what sort of plain are you showing? Also test them by saying the name of a type of a plain and they all have to 'do the hand gesture' immediately—thus making it a game to learn the terms and be able to represent them.

After this you can ask them to write a definition of plains and a geographical explanation of the three ways to create plains.

Ask pupils to look carefully at the three photographic images. Discuss whether it is possible to identify the types of plain they are seeing without the captions. They are likely to find deciding difficult (unless they randomly settle on a yes or no!). Their inferences and explanations should give you an interesting insight into the level of sophistication of their geographical thinking.

The Erosional plain is perhaps the most rugged landscape, but knowing more about location, climate and weather over time are more solid indicators of the type of plain.

Read page three about the plains of Pakistan and where they can be found. You could repeat the structural, depositional and erosional hand gestures adding "Pakistan coastal", "Indus riverside", and "Salt Range and Balochistan" spoken out loud to the correct gesture. Decide if you wish to have any writing added to pupil's notebooks, then move on and then look at the paragraph about planes around the world. You might want to discuss with pupils which types of planes (cold, very dry, hot, semi-arid, dry, temperate, and tropical grassland or savannah) are found in Pakistan.

Plenary

Play the plains game showing the hand gestures or asking for the correct gesture for one of the methods of creation of plains (structural, depositional and erosional hand) or by saying the examples (Pakistan coastal, Indus riverside, and Salt Range-Balochistan).

In lessons 2 and 3

carry out tasks researching/looking at different examples of the physical nature of plains to consolidate the learning about the nature of plains (plains as habitats are looked at next).

Lessons 4-6 What sort of Habitats do Plains provide?

Textbook section: Section 1.2, Contrasting Plains Habitats, Pages 4-5

Aim: To understand how soil, landform and climate impact the nature of habitat possible for different types of plains.

Lesson 4 How do living things adapt to their environment?

Learning outcomes: learners will-
- Describe the nature of plains as a landform and habitat;
- Give examples of their differing nature due to climate influences;
- Use specialist terminology.

In your preview explain that the class are going to study the way that plants and animals are adapted to the environment in which they live, and therefore, that different types of plains sustain particular types of life forms and that this also influences human activity. 75% of the population of Pakistan lives along flood plains (do the gesture).

Activity 1

Read page 4, about tropical plains as a habitat in Africa. Decide if you wish pupils to record anything about the Mara-Serengeti tropical grassland as a habitat and how this has assisted the local economy.

Activity 2

Look carefully at the text below the 'Did you Know?' box and the Food Chain diagram on page 4. Ask pupils to use this information to explain what we mean when we say a creature or plant is adapted to its environment, and to give examples of fauna (creatures) from the tropical plains of Africa that demonstrate adaptations to the environment and flora (plants) of the African plains.

Discuss with pupils whether they might expect that the indigenous peoples of the African plains might have adapted their lives to living in the tropical plains. Explore what they might expect to see if someone was adapted to their environment. Responses might include thinking about food, shelter, farming and lifestyle and possibly art and culture.

There is a research task at the bottom of page 4, you might wish to set for your pupils as a home learning follow-up. If you do so think carefully about the level of scaffolding which is needed and whether you want to suggest particular indigenous peoples, having thought carefully about how challenging it might be to collect information on some groups from resources available. You could create an evidence bag (plastic wallet) of different sources about/descriptions and images of particular indigenous people.

Plenary

Summarise the key points made about plains as largely grassland habitats (with some exceptions) and therefore providing environments suitable for a specific range of types of flora and fauna. Explain that in the next session the class will learn about the indigenous plants and animals of the Indus flood valley and plains.

Lesson 5 Which plants and animals live in the Indus Valley plains?

As a starter activity show images of four of the creatures listed on Page 5 without telling the class what they are or why they are being shown. The animals are all native species in Pakistan.

Choose animals which you think pupils might be able to name, and label them A-D to help in the discussion of the images. Ask if they can name the animals, or/and make any suggestions about what they have in common. Discuss their suggestions and then say that today's lesson is about the animals that live in Pakistan in different parts of the Indus Plain.

Read page 5 with the class, and discuss the information about the Indus Plain, the river basin and the examples of native fauna in Pakistan. Do they feel the wildlife of Pakistan is very diverse? Do they think it is thriving or at risk? Which creatures, if any, do they like most, would they feel bad if any of these species disappeared? Decide if you want to set an activity to record any of the species or find out more about the flora and fauna of the Indus Plain.

Read the section about the threats to the plains, and the passage on invasive species. Discuss the content. The Parthenium Hystrophorus plant or Famine Weed has become a significant problem for agriculture, and the Paper Mulberry Tree is becoming a dominant plant in the foothills of the Himalayas, while the Fauji Khagga (properly known as Bagarius bagarius, a type of catfish) is preying on smaller native fish and becoming dominant.

In your plenary remind learners they have been studying the range of features and habitats that plains offer. Ask them to tell you about how the plains they have learnt about are similar and different.

Lesson 6

Set the class a task which deepens their knowledge of plains as a habitat: for example, carrying out a research activity and creating an artefact demonstrating their new knowledge, for example, a poster about the importance of plains in supporting biodiversity and conservation.

Lessons 7-10 What are the key features of river systems?

Textbook Section: Sections 1.3, pages 6-7; and 1.4, pages 8-9

Aim: To develop an understanding of the terminology and key knowledge related to river systems as a geographic process.

Learning outcomes: learners will-

- Be able to explain the key features of a river system and explain how rivers shape landscapes;
- Know how river systems create a water based and river margins series of habitats;
- Begin to consider how climate influences;
- Use specialist terminology.

Lesson 7 What is a river system?

Textbook Section: Section 1.3, Page 6

In your preview explain that in this lesson the class is going to study another sort of habitat. Hold your hand out flat and wiggle your fingers while moving your arm to trace an S shape— and ask if they can guess what sort of habitat they will study (rivers). Once they have guessed, or after a few suggestions, explain that rivers have an important impact on land shape, and provide important habitats in the water and along the river margins.

You could create a set of matching cards: the key terms, source, confluence, watershed, and tributaries, flood plan, sea level, drainage basin, mouth, channel; and simple definitions to use next. Pupils should close their textbooks and notebooks and try to match the terms with the definitions.

Activity 2

At the bottom of the page there is an explanation of the importance of the Indus River Valley and its water supply. Read and discuss this passage and look at the 'Did you Know?' box. Discuss: how is the Indus changing the landscape and aiding biodiversity; and What might happen if the Indus River stopped providing so much water?

Decide what you would like learners to record in their notebooks. Use your plenary to draw together a summary of the key learning about the nature of river systems.

Lesson 8 How do rivers shape and reshape landscapes?

Use your preview to find out what learners know about rivers: which can they name and where?

What is the definition of a river? Do they know why the water flows in a particular direction? What else would they like to know about rivers?

Activity 1

Read page 7: 'How do rivers change as they flow?'

This text is in three sections: fast flowing slower sections and terminal sections. You could use the hand gesture recommended before to represent river water, moving your arm at different speeds to represent the flow rate.

You could ask pupils to answer these questions:

1. What three characteristics of rivers are described here? (Fast, slow and terminal)
2. Why do some rivers have a rapid flow at their source? (Higher, steeper ground)
3. What impact do eroded materials have on the landscape? (Scouring of material creates V-shaped valleys.)
4. Name one example of an eroded landscape valley in Pakistan. (Neelam Valley)
5. How do rivers often change in their middle section? (Slower)
6. What does the higher level of water in the middle section of a river mean for landscape change? (It allows more material to be carried along the water course.)
7. Using words and images: Explain what is meant by areas of erosion and areas of deposition?
8. (The answer should include drawings like the three diagrams on page 7, and explain why some material is being carried, dropped, or eroded.)
9. What do we mean by the term terminal section of a river?
10. What are the more correct names for the terminal section of the river? (Mouth or delta)
11. What happens to the material being carried by the river as it reaches the sea?

Activity 2

Read the section at the bottom of page 7 'What is a delta?' and look carefully at the satellite photograph of a delta. What do they think they can see? What would they like to know about the image?

Ask whether this information means they want to add anything to their answer to question 10.

In your Plenary: summarise how rivers erode and build landscapes.

Lesson 9 Why are river habitats as important as an environmental feature? Public Information leaflet, part 1

Textbook Section: Section 1.4, page 8.

In your preview show images of some of the river creatures of Pakistan (See list on page 5, or research the diversity of river life), and explain that the pupil are going to learn about river habitats and produce a brochure for distribution to Pakistani families to promote conservation. The first part will be about the habitat that a river offers, and the second part will be about the importance of water in Pakistan and how conservation and preservation are key in protecting the quality of water, the beauty of the landscape, the quality of life for the people, and the economy. Discuss what sort of features such a leaflet might include. Ask what features would be necessary to make the leaflet attractive, accurate and persuasive. Consider the design and perhaps make a list of criteria for assessing the leaflet (and the work at the end of the task) and therefore develop a set of 'success criteria'.

Activity 1

Read the first part of page 8 about river habitats and biodiversity. Ask pupils to summarise the text as an introduction for the information leaflet about Pakistan's river wildlife. This could be completed using a desktop publishing or word processing programme— or just as written prose depending on the availability of time and resources.

Activity 2

Read the section on the middle of page 8 on Rivers and the economy and the section below it on The Watercourses of Pakistan. Ask pupils to use this text, and do some further research to complete the first part of their tourist brochure.

Plenary

Praise any good examples of collaborative and individual working or very effective work (as to model what you want to see) to the whole class. Explain that they will have time in the next lesson to work on the second part of the task.

Lesson 10 Information Leaflet, part 2

In your preview— remind students of the task and give a brief overview of the success criteria before giving them time to work on the second part of the leaflet.

Look at the fact panel on the Indus River at the bottom of page 9, and take a close look at the Irrigation map of Pakistan at the top of page 9. Read the passage on The Indus Delta on the bottom of page 9. Then discuss the key messages around the importance of water to life, work and leisure in Pakistan.

Assessment: provide an opportunity for pupils to peer mark or submit work for teacher assessment

Plenary

Again praise effective work habits and mention the key success criteria agreed to reinforce the sorts of work habits and geograp education continues.

Answers for the end of unit recall questions

Section 1 Quiz Questions

1. The definitions for A. Structural plain, B. Erosional plain, C. Depositional plain, D. Flood plain can be found on: Page 2 in section 1.1.
2. River Valley Civilisations were the birthplace large settled human communities and the beginnings of nations. This topic is more fully developed in the history curriculum and textbook, and has brief coverage on page 6, but may have been mentioned more fully in your exposition around river valley habitats and their capacity for being a rich source of foods.
3. Research-based question
4. Confluence is explained briefly in the diagram on page 6 as the point where two (or more) rivers join. Confluence is often a feature of a delta.
5. Page 7 explains how rivers change as they flow. An Oxbow lake is formed when a slow flowing river meanders and overtime a bend is cut off leaving and isolated curved stretch of water where the bend used to be found.
6. Section 1.4, page 8, River Habitats: states that the Indus River Dolphin is critically endangered.

Section 2 Multiple Choice Questions

1. An alluvial plain is: A. Somewhere which has frequently flooded and now floods occasionally.
2. A flood plain is: B. The frequently flooded edge of a river.
3. A barren plain has: C. No wildlife or plants.
4. Deep see plains are: B. Abyssal plains.
5. Pakistan's Indus River Plain is: B. Heavily populated.
6. A river begins at the: A. Source.
7. Where the Indus River meets the sea there are: B. Conservation team created salt beds, mangrove plantations and mud banks.
8. A meander in a river is: A. A bending stretch.
9. Roughly (C. 75%) Old Pakistan's people live reasonably close to the Indus.

Opportunities for Longer Prose Responses, Debating and Extended Writing

There will be occasions when you want to develop the ability of pupils to either write or speak at greater length, and you will wish to think about where you can plan in regular opportunities to develop literacy and oracy, research skills, individual and collaborative working and the use of information communications technology (ICT).

As learners become older and more independent the approach can be based on less scaffolding and can be made more demanding, but at grade 7 although you will need to gradually encourage more independence from learners, it is likely they will still need support and encouragement. Therefore continue to think about building opportunities for scaffolding reading, writing, speaking, listening, and research. Opportunities to develop pupils ICT skills should increase the focus on geographical skills rather than purely ICT activities which are developing ICT use- but not geographical understanding or technique.

In this chapter about Plains and Rivers you could ask pupils to complete written essays or spoken explanations, for example, on these topics:

1. Explain how natural processes change landforms over time.
2. What are the special features of plains and of rivers?
3. In what ways have river valleys been important in human history?
4. Explain how a river often has different features along its course.
5. What is a delta and why is it an important environmental feature?
6. What contribution does a river make to biodiversity?

Chapter 02

Water Resources and Management

In this chapter, a comprehensive exploration of various aspects related to water resources, their management, challenges, and solutions is presented. Major water sources are identified, revealing the lifelines that sustain regions. Types of precipitation are elucidated, shedding light on the different forms through which water replenishes the Earth. The Water Cycle is explained, tracing the continuous journey of water across various reservoirs. Furthermore, the chapter examines the multifaceted uses of wastewater, showcasing how this resource, often overlooked, holds potential for various applications. It also shines a spotlight on the challenges that Pakistan faces in providing an adequate water supply.

Textbook Section: Pages 11-24

Aim: To develop an understanding of the importance of water resources and its management.

Learning outcomes of the chapter:
Learners will—

- Use specialist vocabulary;
- Use physical maps;
- Identify major water sources;
- Explain types of precipitation;
- Describe the Water Cycle;
- Identify different uses of wastewater;
- Evaluate the challenges faced by Pakistan in providing an adequate water supply;
- Suggest solutions to Pakistan's water supply problems..

Lesson 1–2 Why is water so important?

Textbook Section: 2.1 pages 12-13

Aim: To develop specialist knowledge around water resources and their management.

Learning outcomes: Learners will –

- Consider the importance of water to living things;
- Discuss water availability and consumption;
- Identify the difference between contaminated and clean water;
- Use specialist terminology when speaking and writing about water use.

This activity could form one or two lessons.

As part of your preview ask the class to make a list of all the things that we use water for, and then indicate with a tick any entries where it is vital that water is clean and fit for human consumption. Explain that there is a difference between water in the environment and water that is safe to drink or use for other purposes.

Lesson 1: Why is clean water so important?

Activity 1

As a group read page 12 section 2.1 'The importance of water.' Ask if they know why salty water is not fit for drinking and look at the two terms 'saline' and 'desalination'. You might wish to have pupils write these words in their notebooks. Too much salt in the human body begins to impact on the ability of some of our vital organs to operate and has an impact on our blood. We cannot therefore drink sea water, and a number of sailors and airmen who found themselves in lifeboats after disasters became very unwell after drinking sea water. Others who were shipwrecked and made it to desert islands became very ill from drinking river water which, although not salty, was contaminated with animal waste or other pollutants.

Ask pupils to write down a short explanation of why clean water is so important to humans, our crops, and our livestock.

Lesson 2: Why does a shortage of water present problems?

Activity 2

Read the introductory paragraph at the top of page 13 and ask pupils to explain why shortages of water are sometimes experienced in Pakistan. Ask them to write a simple definition of 'over-abstraction' in their notebooks.

Then look at the surplus and shortage table. Years of statements explains why different locations might experience surplus water supply, and other shortages. There are seven statements on each side, and you could set the task of deciding which statements most explain surplus, and which statements most explain shortage, and then writing up an explanation using no more than, for example, three statements from each column.

In your plenary ask the group to summarise why there is such variability globally around water supply. In some countries and cities it has become a popular joke about how much it rains, for example, Western Ireland, Manchester in the UK, or even Rawalpindi and Murree in Pakistan. But in places where there is shortage, it is not so funny and people resort to using contaminated water because they have no choice if there is no alternative supply. You could discuss whether the global community is doing enough to ensure that everyone has clean water.

Optional Home Learning

You could set the task of looking at the websites of some of the charities which raise funds for boreholes to ensure that water supply is clean and adequate. For example the large charity WaterAid which operates globally www.wateraid.org, or smaller charities such as BondoAid, www.bondotrust.com, which operates in Ghana or Paani www.paaniproject.org.

which operates in Pakistan.

Lessons 3-4 Water as a feature of the environment.

Aim: To develop an understanding of where water is found in the environment and how it is circulated in the water cycle.

Textbook Section: 2.2, Pages 14-15.

Learning Outcomes: Learners will –

- Explain where the main sources of water are found in the environment;
- Explain the water cycle and the system of groundwater recharge;
- Use technical vocabulary in relation to water in the environment;
- Explain why relative humidity varies across Pakistan and the impact that this has on the availability of water.

Lesson 3

In your preview, explain that today you're going to look at water as a feature of the environment and acquire some specialist vocabulary for describing the way that The Water Cycle and movement of water around the environment operates.

Activity 1

Read the first half of page 14, 'The Water Cycle.' There are a number of key definitions in this passage which you might want to ask pupils to write into their notebooks. Ask the class to make a copy of the water cycle drawing or giving them a copy to stick into their notebooks, to help them in describing, and later recalling the process.

You could represent this physically infront of the classroom by asking a group of four pupils to stand in a line. They should hold A4 sheets of paper with the part of the process they represent written in large print: sea, clouds, rain, clouds, land.

You could have a see-through bag of clean water that is sealed, or a glass jug of water to represent the water in the environment.

Walk along the line and explain how the water moves around the environment, moving the bag or jug to represent the water travelling into different parts of the environment.

Start at the sea and explain that water evaporates into the atmosphere. It then travels as small particles in clouds, (the water should now be with over the child who is representing the clouds), and eventually rain clouds form (move on to child 3) and any additional water from transpiration or condensation falls as precipitation from the rain clouds and onto the land (and/or sea) (move to child 4). Some turns into ground water on the land, and some becomes surface run-off, and passes into water courses. The water can then evaporate or transpire through plants back into the atmosphere or evaporate from the sea, and the cycle continues.

So, by demonstrating that the water is physically moving around the environment the children should have the idea of the water cycle more clearly embedded… and hopefully, nobody is soaking wet!

Decide if you want pupils to write something down about this process, or if having the diagram is adequate in helping them understand the process.

Activity 2

Now read the remainder of that page and decide if you wish learners to write anything down. As part of your plenary, restate some of the key terms and check that the group understands the notion of The Water Cycle as a process.

Lesson 4 What geographical terms do we use to describe water features?

Aim: To correctly use the specialist vocabulary associated with water features.

Learning Outcomes: Learners will –
- Use specialist terminology correctly;
- Be able to describe a landscape's water features;
- Give examples of water sources;
- Understand the term 'groundwater recharge system'.

In your preview explain that today we will focus on using the correct vocabulary for landscape features that are associated with water.

Activity 1

Make A4 or A3 copies of the landscape that is shown on page 15, with the labels removed. Also make a set of labels for the features on small cards. Make up sets of the image of the landscape and one set of cards in separate envelopes or folders to make it easy to give out the sets and collect them in at the end of the lesson.

With the pupils' notebooks and textbooks closed, have them work in small groups to use the cards to label up the landscape features. Tell them that they are only allowed to place a label card onto the drawing if they are able to define what are the features they are labelling: for example a lake "is a large body of inland water". In this way, students should be refining their understanding of what the terms mean and where the different features are likely to be found in a landscape. Some terms will be more familiar than others so try to reinforce the less familiar terms when discussing the water related features/in the closing plenary.

Decide how you would like to consolidate this activity— perhaps providing a copy of the image to stick in notebooks or asking learners to complete a table of landscape features associated with water with the key terms in the left hand column and an explanation of the definition of that term in a wider right hand column.

Activity 2

Where do we find water?

After tidying away the cards, read the remaining text on page 15 which begins as'Water can also….'.

This will help pupils understand that bodies of water exist in several different forms.

Together look at the diagram of the Groundwater Recharge System, bottom right of page 15.

Ensure that pupils understand this term, which is explaining how groundwater is replaced. This is the same process as the water cycle but note the specialist term is referring to the way that the water table is replenished. Pupils may not be familiar with the notion of a water table, so ensure that you explain that this is the level of underground water at any location. When charities are sinking boreholes for water pumps in arid and semi-arid locations they are drilling down to the water table and seeking the groundwater which will have been filtered by any local soil and rock. Example charities which work on this are mentioned in later tasks.

Plenary

In your plenary, you could have a fun quiz asking pupils to write a series of simple questions related to key terms associated with water features. Once they have two or three questions each, then you can begin to test each other (and the quality/difficulty of the questions) out.

When ready: Ask pupil X to pose their question to pupil Y, then pupil C to pupil G and so on, moving around the class and having some fun with how well pupils can recall or explain the key information. Make this reasonably light-hearted and non-threatening, and use it as a diagnostic exercise to see if pupils have understood the information you have been trying to transmit.

Lesson 5-6

Aim: To explore the nature of precipitation as an environmental feature.

Learning Outcomes: Learners will –
- Explain how precipitation is a part of the water cycle;
- Demonstrate an understanding that precipitation can take several forms;
- Evaluate how precipitation levels shape habitats.

In your preview ask the group to remind you how the Water Cycle works. Talk through the process of water moving around the environment and then lead into explaining that evaporation means any salinity is left behind.

Why is precipitation important?

Activity 1

Read the first two sections of page 16 'Why is precipitation important?' and 'Types of Precipitation'.

Decide if you want to ask learners to record anything in their notebooks.

Then move on to read the final part of the page, and then ask learners to answer these questions:

1. Why does temperature and amount of precipitation impact on flora and fauna in a location?
2. How are rainforests able to support a wide variety of flora and fauna?
3. Are arid environments totally unable to support flora and fauna?
4. What do we mean by adapting to an environment? In your explanation give an example of animal adaptation.
5. How do humans adapt to their environment in Pakistan?

Why is weather and climate data important?

Activity 2

Read the two paragraphs at the top of page 17 with the class, and then ask the class to write answers to these questions:

Why is it very important to a modern society to have efficient climate and weather monitoring?

How does technology help us achieve strong climate and weather monitoring?

Now read the 'Did you Know?' box about rain gauges and ask learners to explain 'What is a rain gauge?'Read the paragraph on 'Rainfall Patterns in Pakistan' and set them questions to answer to capture the information.

In your plenary ask the pupils to explain what is meant by precipitation.

Lesson 7 How can we link Climate and Rainfall in Pakistan?

(* this lesson has a potential to extend into further lessons)

Aim: To understand the relationship between climate and rainfall.

Learning Outcomes: Learners will –

- Use climate and rainfall maps to analyse the levels of rainfall across Pakistan and explain how this helps monitor and predict climate patterns.

In your preview ask what the difference is between weather and climate. The European Space Agency explains this as follows: 'Weather refers to the short-term conditions of the atmosphere, while climate describes the average weather conditions over a long period of time'.

What are the Climate Regions of Pakistan?

Activity 1

With the class looking carefully at the *Climate Regions of Pakistan map* on page 18. Help pupils understand the map and what is being shown by discussing the map.

What are the annual rainfall patterns in Pakistan?

Activity 2

Then move on to the Annual Rainfall map for Pakistan on page 19, again help pupils understand the map and what is being shown in your discussion/in responding to any questions they might have.

Explain that on rainfall maps an Isohyet is a line connecting points which have the same levels of rainfall over a fixed time span. On climate and temperature maps isotherms are lines that connect places with the same temperature over a fixed time span.

Decide how you would like pupils to record any main points you feel they should have in their notebooks about linking climate and rainfall.

In your plenary summarise the value of climate and rainfall maps, and remind the group what such maps can tell planners and others. Ask the pupils whether they felt interpreting these maps was difficult. If some say yes, then reassure them by saying it does get easier with familiarity.

Potential extension

If you have access to the Oxford School Atlas look at other climate and rainfall maps to compare then with the maps for Pakistan. Can they see any correlations between the rainfall and climate?

What else would be useful to help them understand the relationship between the two more fully?

Lessons 8-9

Textbook Section: 2.5 pages 20-23

Aim: To understand and be able to explain the importance of managing water resources.

Learning Outcomes: Learners will –

- Explain why managing water resources is an important step in environmental protection and sustainability;
- Discuss how human action can negatively and positively impact on water quality;
- Explain how acid rain is formed;
- Evaluate the methods used for water purification.

Lesson 8 Why is it important to manage our water resources?

In your preview explain that today we will look at water management, and ask what we might mean by managing water resources.

What problems does Pakistan face with water supply and quality?

Activity 1

Read the introductory paragraph: 'What problems does Pakistan face with water supply and quality?' page 20, and ask the class to summarise this by writing an answer to:

Why does Pakistan need to manage its water use carefully?

Now read middle section of the page, and ask pupils to answer:

What is Acid rain and why is it a problem?

Now, ask the group to write the sub-title 'Water Purification Key Terms'. Then, read the remainder of the page to the end of the diagram and make notes in their notebook to state what is meant, in relation to water purification, by:

- Boiling
- Filtering/Filtration
- Distillation
- Sedimentation
- Chlorination

Ask the class to read page 21 to add Reverse Osmosis to their definitions/explanations then add a coloured box around the water purification methods

In your plenary restate, or ask pupils to tell you why water use needs to be carefully managed in Pakistan because of climate issues.

Lesson 9 What steps are being taken to provide enough clean water?

In your preview explain that we will now look at what is being done to make our water supply safe, secure, and sufficient.

Water Purification and Water Desalination

Activity 1

Using the two diagrams from page 21 explain the processes of water purification (top diagram) and reverse osmosis to desalinate sea water. Decide if you will give the children a photocopy of the two processes, possibly with the labels removed.

Ask individuals to explain what is happening at each stage to check their understanding.

Securing a Clean Water Supply

Activity 2

Read the section on page 22 on 'Securing a Clean Water Supply', and look at the image of a desalination plant- ask whether the earlier diagram, showing the process of desalination, (page 21) helps them guess that the tanks and chimneys are for in the desalination plant photograph.

In your plenary discuss why desalination is not a solution for the whole country's water needs (too far to pipe the water before its quality declines and it becomes brackish/ is too expensive as a process) and summarise what has been learnt today.

Lessons 10-11 Managing Water Conservation and Treatment

Lesson 10

In your preview explain that this lesson will cover the way that careful management of our water resources can help the country meet its needs. We will look at water power, water conservation and consumption control as well as management of waste water and creative solutions which use modern technology to turn a problem into a benefit.

River Control and Power Generation

Activity 1

Read the 'River level control and hydro-electric power generation' section on page 22.

Ask learners to answer these questions:

Why does holding back river water with dams present benefits and challenges?

Why are dams needed for hydro-electric power (HEP) generation?

Which organisation manages Pakistan's HEP?

What are the current and potential levels of HEP power generation from Pakistan's rivers?

Encouraging Water Conservation

Activity 2

Read the 'Encouraging Water Conservation' passage on pages 22-23, and set this task:

Explain why water conservation is aided by:

Harvesting rain water;

Using 'Grey Water';

Encouraging a reduction in water use;

Changing habits to a. prevent contamination of water, b. encourage an awareness of amounts of water used, c. help maintain the national supply system more efficiently.

In your plenary sum up the key points about how the conservation of water can be managed and assisted which have been covered today.

Lesson 11 Making a Difference

Activity 1

In your preview explain that today we will look at what can be done to make a difference with water use and conservation, and how we might turn problems into benefits.

Read the 'To Discuss' panel on page 23 and debate which of these approaches might make the greatest difference. This could be a short conversation or a full debate with research and planning time.

Managing our waste water

Activity 2

Read the remainder of page 23 and discuss how dealing with waste and contaminated water is an essential part of managing water use and conservation.

When you discuss the use of biogas as a way of generating power from waste, remember to mention that this is a good example of how technology helps us solve some of the challenges humanity faces as a result of an ever-increasing population, and how this helps turn problems into benefits.

Ask pupils to write a panel in their notebooks which is called 'Interesting Facts about Wastewater Use' based on these three paragraphs, and to put a coloured box around it after finishing

Optional Home Learning

You could ask pupils to:

- Respond to the 'Going Further' box on page 23,
- Make a small model to represent either the process of desalination or water purification.

In your plenary sum up the learning about water conservation steps from today's lesson.

Answers for the end of unit recall questions.

Section 1 Quiz Questions

1. Pupils are asked to define six terms: these are the textbook pages where the answer can be found:
   A. hydrology page 11; B. Eau Potable page 12; C. Evaporation page 14; D. Condensation page 14; E. Precipitation page 14; F. Transpiration page 14.
2. Convectional and relief rainfall is explained on page 17.
3. Research-based question.
4. Page 20-21 covers this topic.
5. Page 20-21 covers this topic.
6. Sewage treatment is discussed on page 23.
7. Wastewater use is briefly discussed on page 27.
8. Solutions to water shortages are discussed on page 22.

Section 2 Multiple Choice Questions

1. Non-potable water is A. Not fit for drinking.
2. Schistosomiasis is transmitted by: C. Parasitic worms.
3. LEDC means B. a Less economically developed country.
4. The water cycle is: A. A process in which water circulates through the environment.
5. Precipitation can include: C. Sleet, snow, rain.
6. Saturation is: B. So much water soaking into the ground that no more can soak in.
7. The Western Depression is: A. A rainfall pattern experienced in Pakistan as a result of the cyclone system.
8. Grey water is water which has previously been used and which is: B. Uncontaminated.

Opportunities for Longer Prose Responses, Debating and Extended Writing:

In this chapter about Water Resources and Management you could ask pupils to complete written essays or spoken explanations, for example:

1. Explain the water cycle and its importance to life in Pakistan.
2. Explain the steps that are taken in water purification to ensure the people of Pakistan have healthy drinking water.
3. What solutions can be suggested for Pakistan's challenges around water supply?
4. Is it the duty of ordinary citizens to conserve water? (Debate)
5. Technology is crucial in Pakistan's battle to provide enough water. How far do you agree?
6. What is biogas, and why might it be an important element of 'saving the planet'?
7. What challenges does Pakistan face with water supply and quality?
8. Using rainfall and climate maps as a source explain the process which brings water to the people of Pakistan.

Chapter

03 Settlements and Land Use

This chapter is focused on the nature of settlements and how they shape land use and economic activity.

Aim: To explore how settlements are classified by geographers, and how their features are determined by settlement size, along with other factors and in turn how location and settlement nature shapes economic activity.

Learning outcomes of the chapter:
Learners will—

- Evaluate how land shape and nature influences settlement location;
- Recognise and classify settlement types;
- Identify how settlement size shapes facilities and function;
- Reflect on what influences choices around where people live and work;
- Analyse the nature of infrastructure found in different types of settlement;
- Use a range of specialist vocabulary in relation to settlement nature and land use.

Lesson 1 How and why did settlements develop?

Textbook Section: 3.1, pages 26-27

Aim: To explore the causal factors that shape settlement formation, and the nature of early settlements

Learning Outcomes: Learners will-

- Explain the movement from hunter-gatherer life to a settled agrarian life;
- Differentiate between a settled and a nomadic lifestyle;
- Explain the notion of subsistence farming, and specialisation / differentiation of tasks.

Read the section Early Settlements and Land Use. In your preview explain that today's lesson will look at one of the things that makes humans different to most animals, that we settle together and form communities of families who are not related to each other. As soon as you make this point children will be trying to think of examples of animals which live together in a communal way, such as ants and bees, and although these are creatures which are settled in a place and co-depend on each other the circumstance and features of their lives is different. These creatures are related to each other and are not forming colonies which connect with others in the way that humans do.

Activity 1

Read page 26 'Early settlements and land use.' The children might bring prior knowledge to the sessions from History topics they have studied previously or seen on the internet/TV/ read about in books.

Ask the class to answer these questions:

1. What does nomadic mean?
2. Why were early humans nomadic?

3. What did early humans learn to do that meant they could farm?
4. What and when was the Neolithic Stone Age Revolution?
5. How did the nature of settlements develop from single farmsteads into something larger?
6. What do we mean by specialised roles in a society? Why was this a major step for human?

While drawing the lesson to a close, carry out a plenary which draws the key points together.

Lesson 2 What are the characteristics of a civilisation?

Activity 1

Read page 27, 'What are the characteristics of a civilisation?'

Ask the pupils to design a diagram or make a mind map which shows the six characteristics of civilisations.

Why do civilisations vary?

Activity 2

Discuss with the class, and then ask them to write something in their notebooks to explain:

Why do civilisations vary?

Why does it help us understand history and geography if we study settlements?

Now look at the paragraph titled 'Conditions suitable for a settlement' with the class.

Discuss what is meant by the term infrastructure and challenge the class to close their books and tell you what we mean by infrastructure in modern settlements. Decide if you wish pupils to write down anything about infrastructure and/or to give any examples.

(or additional lesson)

Activity 3

Look at the list early civilisations on the right-hand side of page 27.

Evidence from the fossil record suggests that humans evolved in northern Africa, and gradually spread out across the world. This list, and what we know about our history, shows civilisations formed on all of the continents except Antarctica.

Explain that many of these early civilisations began as river valley civilisations— which they will learn about more fully in their history lessons.

Optional Home Learning

You could ask pupils to research one or more of these civilisations with a geography rather than a history slant: Where was the civilisation located? How widespread was it at its peak? Where did it begin and why (what geographical influences were at work) and so on.

In your plenary, summarise what was covered in these lessons on the characteristics of a civilisation.

Lesson 3-4

Textbook Section: Section 3.2 pages28-29

Aim: To look at how geographers classify settlements by population size, shape and layout; and to consider the factors that shape choices around settlement location.

Learning outcomes: Learners will-
- Know how geographers classify settlements;
- Explain what influences choice of location;
- Use specialist vocabulary.

Lesson 3

In the preview explain that today's work is about how we classify settlements in terms of size and shape.

What terms do geographers use to classify settlements according to size?

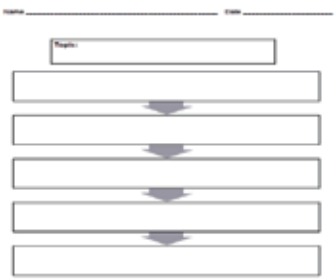
Activity 1

Look at the diagram showing the different names we give to settlements of different size on top of page 28.

Decide how you would like pupils to record the definitions of settlement size. You could, for example, create a flow chart with the settlement names in size order— pupils will need six boxes to list the settlements: conurbation city, town, village, hamlet, isolated dwelling…. Or seven if you wish to add megapolis.

Calculate how much space is needed to help them layout the correct amount of space in their notebooks so their books stay neat, or provide a printed/photocopied version for pupils to complete and stick-in.

Option 1 (simple version)



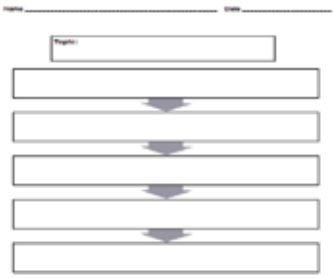
Settlement Name

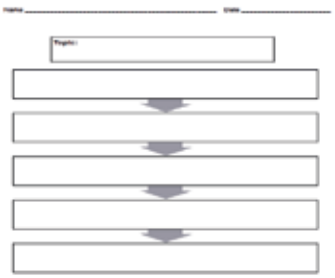
If you want to plan ahead, you could ask pupils to create a double set of columns so that in a later lesson they can add examples of infrastructure found in particular settlements.

Option 2 ('Future-proofed' version) Note

make the rows wider than in Option 1, as there will be a larger number of words in the right-hand column for the larger settlements. You might find it helpful to make a trial version to ensure you have the size correct, and to show pupils a blank and a completed version, remembering that pupils writing might be larger than that of an adult.

Settlement Name Settlement Infrastructure





How do geographers classify settlements?

Activity 2

Look at the four different ways that geographers classify settlements on page 28.

Ask pupils to set out some space in the notebook in the form of two columns and two rows- and to not add the line which will divide the two rows until the first two categories are written into the table.

Population Size	**Landscape Setting**

Once they have summarised entries 1 and 2, they can add the bottom line, and create a table of two rows and two columns (the first row will be relatively narrow, the second needs more space). So again, ask them not to add the very bottom row until they have completed the whole table.

Population Size	**Landscape Setting**

Layout and Shape (This will have the most text in it)	**Functions and Occupations**

Pupils should use the information on page 28 to complete the table in their own words.

Optional Home Learning:

Ask learners to talk to family members about the 'To Discuss' panel on page 28, and to write up their answer in response to the question there: 'What do you think is likely to make a settlement grow, stagnate and decline?'

In your plenary, carry out a quick question and answer session about how geographers classify settlements.

Lesson 4 What are locational factors in geography?

In the preview explain that today's lesson will help them consider locational factors: the things that influence why a particular location or site is chosen.

Having researched the answer prior to the lesson: Ask the class if anyone knows how old the place where the school is (local village/town or district), and "why is it where it is located?"

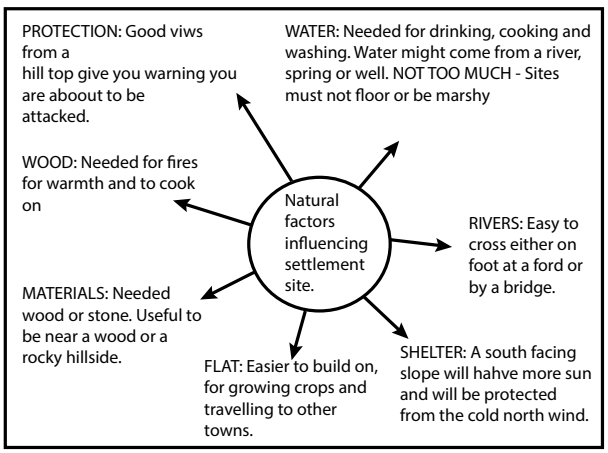
Explain that looking at how geography shapes human choices about land use is a fundamental element of geography overall and informs several of the specialisms within the discipline.

Factors which influence site location.

Activity 1

Read the definitions at the top of page 29.

Ask the group to use the information on the top of page 29 to make a spider diagram to show the factors which influence the location of settlements:



Where would you build?

Activity 2

Using the picture at the bottom of page 29 (which shows a landscape with a series of features), tell the pupils that they will have to listen carefully to hear a description of the different parts of the landscape.

A. Dense hardwood forest. Very strong building material but hard to cut down and clear.
B. Rocky hillside, with good building stone.
C. Coastal marshland, flat with low plants and lots of insects and prone to saltwater flooding. Some palm trees and mangroves along the coastal margins.
D. Riverside flatlands, prone to low level freshwater flooding on the river margins.
E. Less dense woodland, wood is suitable for low level building.
F. High grasslands and plains. Limited running water.
G. Coastal edge fields, flat lands around a metre above sea level.
H. Ancient and decaying woodland.

In your plenary, summarise the input from today about the factors which influence choice of site location.

Lessons 5-6 City, Town, or Village

Textbook Section: Section 3.3 Pages 30-31

Aim: To identify the reasons why people are attracted to particular locations and develop an understanding of the nature of push-pull factors which influence choices.

Learning outcomes: Learners will –

- Explain causal factors in choice of settlement location for where we live and work in the modern world;
- Understand what the term push-pull factors means in relation to the choice of settlement location, and give relevant examples;
- Explain differences between different types of settlements in Pakistan;
- Understand technical terms and use them correctly.

Lesson 5 City Town or Village?

What attracts people to particular locations in modern times?

Activity 1

In the preview explain that this lesson is about how we choose where we live and work today, and how push-pull factors are influential in our decision making. Explain that for some of us we live where our parents and grandparents have lived for a long time, but that in the modern world more and more people are moving to towns and cities to pursue education, training, and employment.

Start by reading the first two paragraphs on page 30, which explain some of the modern causal factors in choosing where we live and work. Discuss the reasons why modern people live in particular places, and how this is different to the common reasons from people in the past.

Why do push-pull factors influence our choice of where we live and work in the modern world?

Activity 2.

Read the push-pull paragraph together and discuss what it says.

Ask pupils to explain how push-pull factors influence where people live and write their responses in their notebooks.

What do we mean by 'infrastructure'?

Activity 3

Look at the infrastructure (images panel) with the class, and then read the Standard of living/Infrastructure definitions box. Discuss what is meant by infrastructure, and what specific examples might be included in each category, e.g., energy= power stations, supply lines, transfer stations, pylons; education= nursery, primary and secondary schools, colleges, and universities

Decide if you wish learners to write anything in their notebooks.

In your plenary summarise the discussions and learning from today: modern reasons for choice of location can vary compared to those in the past; push-pull factors can be influential and available infrastructure matters.

Lesson 6

In your preview explain that you are going to consolidate the learning from the last lesson with some short writing. Ask what they learnt about how people choose where they live, then read and discuss the first section of page 31 'How do people choose where they live?'

How does Infrastructure shape choice?

Activity 1

Use the 'To Discuss' box to have a conversation with the class about facilities in different settlements. Ask pupils to copy and complete the 'Facilities you might find in a…' table in their notebooks.

Differences in Settlements in Pakistan

Activity 2

With the class, read the second half of page 31 'Differences in Settlements in Pakistan.' Here the suggestion is that topography, or land shape is one of the key determinants in shaping settlement nature and size in Pakistan. Look at the images: do they agree that the nature of the land is a key factor, or the key influence, or just one of many?

Discuss how the images show different sorts of setting. Ask whether we also get a sense of the likely infrastructure? What inferences can the class draw about the nature of each place? Do more remote places suffer from lack of infrastructure, or might there be advantages for those communities which more urban setting do not have available?

Optional Home Learning

You could ask pupils to carry out the Going Further task at the bottom of page 31: How does the settlement determine the lifestyle of people living in it?

In your plenary reiterate that some people in the modern world have more choices than others about where they live- and a lot more than most people in the past! Summarise the work done in the lesson about how the location impacts on the nature of the settlement.

Lessons 7-8 What are the challenges faced by towns, cities, and megacities.

Textbook Section: Section 3.4 page 32-33

Aim: To examine the challenges faced by towns, cities, and megacities.

Learning outcomes: Learners will –

- Demonstrate an understanding of the challenges faced by towns, cities and megacities;
- Differentiate between a conurbation and a megapolis;
- Evaluate the challenges faced by large population centre;
- Review potential solutions to the problems of large population centres.

Lesson 7 How do geographers differentiate between the very big population centres?

In the preview explain that today's lesson is about the challenges which the very large settlements have to resolve to function efficiently. As a starter activity you could look at a series of statistics which relate to one of the largest megacities: size in square kilometres /miles population, etc., and ask if they can suggest any reasons why managing a city of this size would present problems. Record some of their suggestions on your classroom board and let them discuss what others have said: do they agree with all the suggestions? Are some problems more pressing than others?

What is the difference between a conurbation and a megapolis?

Activity 1

With the class, read the top two sections of page 32, the introduction and the 'Conurbations and megapolis' section. This explains the challenges faced by the biggest settlements.

You might wish to have pupils write a definition of the terms 'Conurbation' and Megapolis and draw a coloured box around each to help them stand out. Ask them to write an answer to; 'What is the difference between a conurbation and a megapolis?'

Optional Home Learning

- You could ask pupils to complete the 'Going Further' task on this page. If you do so, we suggest you:
- use the 20 cities in the table from page 32,
- provide a copy of a world map, and
- explain what is meant by the international date line and time zones so that learners know what is meant by the things they are being asked to mark onto their map.

The fastest way to check if the pupil's maps are reasonably accurate is to do the task yourself on a traced copy of the same world map that pupils use, using tracing paper or an acetate sheet. This allows you to lay the sheet over the pupil version and see if their positioning roughly matches yours.

Where are the top 20 Mega Cities?

Activity 2

Read the 'Location of mega cities' text and look at the table of figures on page 32. Lead a discussion about what these figures tell us. Where are these cities? Why are none of the 'old cities' of Western Europe on the list? Why are there so few of US cities, and none in Australasia-Oceania.

You could ask pupils to mark the location of these cities (if you have not done so in a home learning task) on a world map. Different groups of pupils could be asked to research a fixed series of things about some of the mega cities, from different continents and countries, to facilitate a comparison. Many of these cities have seen massive recent growth, have on average 'young populations' in terms of the population age profile for example, and act as a magnet for urban drift— all issues which can be discussed in the next lesson.

During the plenary remind learners of the meaning of the definitions of megapolis and conurbation, and of the characteristics of the largest settlements.

Closing activity The Megacities Game

You could end with a game using flash cards. Print the names of some large cities on sheets of paper, one per page – or if you have a multimedia projector written as one per slide in PowerPoint or similar. Some of the cities should be the megacities shown on page 32, others just large cities. When you begin, give them a minute to study the megacities list in the textbook before closing it. Show a city name. If the pupils think it is a megacity they stand, if not, they sit. You give the answer once they have all decided, and they keep a tally of how many times they were each right. The idea is to keep up a good pace without the class getting over-excited or being dangerous in standing and sitting!

Work through several city names (maybe 10-15, depending on time and class nature), and then ask, "Who has 5 or more points?" If it is a lot "Who has 8 or more?", "Who has 10", etc… making a judgement about the size of jumps. You could make the game more complex or challenging by adding in definitions, characteristics, reference photos as well as incorrect versions.

Lesson 8 What challenges do our large population centres face, and what solutions might be possible?

In your preview you could play the in the dark version of the game. The class close their eyes and put up an arm if the statements you make are true and lower it if false (they are then unable to see what the others think and have to make a choice). Remind them that they should not hit the person next to them while raising or dropping their arm!

Give them one or two examples, then play the game properly:

"Last lesson we looked at… the differences between villages and towns" (arms down)

"Megapops and contortions" (down)

"Megapolis and conurbations" (up)

"Examples of Megaliths" (down)

"Examples of towns of over a million people" (down)

"Cities like Tokyo-Yokohama and Beijing" (up)

And so on… keep the activity paced and fun.

Then explain that today's lesson will help develop their understanding of why running these mega cities can be quite a headache for planners.

What are the challenges for our large population centres?

Activity 1

Read the text at the top of page 33.

Use this to report on the needs and challenges of a large populations centre.

Ask the group to do this in their notebooks in a visually interesting, accurate and well-designed way.

This could involve the use of colour, a spider diagram for needs and a list with little pictures for problems (tell them to get the words written down first so none are missed).

What solutions can we implement?

Activity 2

Now read the remaining text on page 33 in 'Solutions to these challenges.' Ask the class to suggest and then discuss any practical solutions that might be possible (see 'To Discuss' box). Decide if you wish the pupils to write anything down as a way of consolidating any learning from the discussion.

In the plenary ensure you talk about challenges and solutions, and ask them to think about whether they would want to live in a megacity.

Optional Home Learning

Learners could be asked to-

Further research one or more megacities and conurbations and write a letter of advice to their future self about whether they think it is a good idea to live in one of these very large population centres.

Lessons 9-10 Settlements and their Economic Activity

Textbook Section: Section 3.5 pages 34-35

Aim: To consider how different sized settlements can support particular economic activities.

Learning outcomes: Learners will –
- Explain the distinctive nature of rural and of urban settlements;
- Compare rural and urban;
- Make inferences about economic activity and its relationship with market size and raw materials, labour, and investment.
- Use technical vocabulary correctly and with confidence.

Lessons 9 How does settlement size and location have an impact on economic activity?

In the preview say that today's lesson will examine the difference between typical patterns of rural and urban economic activity, and will help them think about how land shape, and features, infrastructure and access to the population have an influence on economic activity.

Ask them to help you create a definition of what is meant by the term economic activity.

Then explain that geographers use a number of terms to describe an economy. Explain what is meant by a cottage industry, where people work from home in small scale of manufacturing or creation of objects. In many parts of the world, the process of industrialisation has reduced the number of cottage industries and brought smaller and larger factories into business. Early cottage industries were fulfilling a local need and using mainly local raw materials because in the past long-distance trade (explain the idea) only took place for the most valuable commodities (explain the term). Populations were much smaller than today, and most people worked in farming. People began to specialise in work outside of farming, and today most people work in industries which are outside of agro businesses, as they learnt in previous geography and history lessons.

What economic activities are common in rural settlements?

Activity 1

Read the top section of page 34. Explain that without farmers we would all be in trouble since someone needs to grow the food we need and today most people specialise in other jobs.

Ask learners to answer these questions/respond to task 4:

1. Why is agriculture often at the centre of a rural economy?
2. What sorts of work is involved in agricultural activity?
3. What sorts of economic activity, apart from agriculture, might be found in rural areas?
4. Give an example of the sort of high quality, high value, work and crafts production that is still carried out in cottage industries in Pakistan. (See 'Did you Know' box about Pakistan's embroiderers).

What shapes the economic activities of urban settlements?

Activity 2

Read the bottom section of page 34, 'Urban Settlements' and discuss it with the pupils.

Ask pupils to create a 'Service needs' diagram to show the complexity of town and city life, which we often take for granted.

Start with the term 'urban resident' in the middle of a notebook page. Think carefully because the idea is to create a chain or web of links between workers and needs in an urban setting.

What does an urban dweller need?

Clean water	Shelter-a home	Food
Drinking Water company workers Plumber		
Wastewater company workers		
Urban resident	Work and Money	Friends, leisure time
Government to control Standards and service		
Health support	Safety and Protection	Ability to move around

Lots of the jobs will connect to other jobs to be able to function: a plumber needs training, plumbing supplies, tools— thus needing suppliers and makers of specialist items… Very soon this starts to take on, and show, complexity. The retail food seller needs access to a market to buy wholesale, and wholesalers need access to farmers who might specialise in particular crops. Farmers need machinery makers and menders, seeds, livestock, and so on.

To some extent pupils do not need to get an exhaustive list compiled once they understand the 'everything-ness' of being in a city, from the vital job of collecting rubbish through to the neighbourhood dentist, shopworker, and so on…

Discuss what we mean by the term market in a business sense, and why villages cannot sustain most specialist roles due to the small size of their population and thus have an uneconomic market or demand market. Some villages which are close to the edges of a large build up are able to sustain some economic role which a very remote or rural village might not, for example, hairdresser, or architect's practice.

Activity 3

Read page 35 which distinguishes between skilled and low wage labour. Note that the term low skilled is deliberately not being used as a low paid worker might be highly skilled in specialist tasks. There is also the issue of avoiding disrespecting someone's family or causing offence if particular work roles are made to seem lesser or lowly.

The pupils could underline some of the work roles in their previous task to sow which they feel are very skilled and use a different colour to add a dot next to jobs which are low wage. However, you might wish to work with the whole class to do this as their level of understanding of particular work and its demands might be limited.

You might wish to get pupils to define skilled labour and low wage labour.

In your plenary mention that all honest work is important. In the theory of communism, the payment of vastly different sums to different workers is criticised as exploitation and a power and control issue. However, modern communist states still allow private ownership of some businesses and private wealth provided the businesspeople concerned cooperate with the ruling community party.

Does the class think it is fair that different work gets different pay? What do they want to do when they become workers? Does helping others or earning lots of money matter to them most or is one of the two better than, or just different from the other?

Optional Fieldwork or ICT based activity/Extension

You could set aside a lesson, and if necessary, prior to the session/follow-up class time to either make a class visit to a district, town or village to see what economic activity is taking place, or

if you have access to computer facilities use Google Maps or other programs to look at the range of economic activity in a particular place. This could be supported with a telephone directory, local business guide or other sources to get a sense of what businesses operate in particular locations, e.g., village main streets, town shopping streets, industrial areas of a city or port.

Alternatively, you could create a pack with a map, photographs and other sources about a particular location to create an economic geography case study/investigation with sources to provide information about the economic activity that can be sustained in particular locations. Over time you can add additional locations which support different sorts of activity- a small village, a fishing port, a railway town, a city exclusive shopping district or mall. Groups might investigate and report on the different ways that setting, and population helps determine economic activity, and service level. A mountain village will not, for example, support a specialist heart-disease treatment hospital and research centre because the need and specialist workers will just not be present, but a city with other towns nearby can do so.

Answers for the end of unit recall questions

Section 1 Quiz Questions

1. The definition of settlement is implied on pages 26-27; village is covered on page 30 , megalopolis page 32, and conurbation page 32.
2. Page 26 explains the term hunter-gatherer.
3. Research-based question (text related to settlement patterns is on page 28).

4. Megacity is defined on page 32.
5. Students will do the map activity.
6. Push and pull questions are explained on page 30.

Section 2 Multiple Choice Questions

1. Nomadic means: A. People who move around.
2. A dispersed village is: B. Spread out.
3. An isolated settlement is: C. Away from other settlements.
4. A ribbon settlement is: A. A narrow development built along a road.
5. Baghdad, in the 8th century CE, had a population of: B. 1 million.
6. The term topography refers to: B. The form and features of land services.
7. The term standard of living refers to: C. The level of comfort, wealth, and material resources for an individual.
8. The term infrastructure refers to: A. The key facilities in a settlement.

Opportunities for Longer Prose Responses, Debating and Extended Writing

1. What reasons can you give to explain why early humans chose to form settlements and settle in one place?
2. In what ways are villages different from cities?
3. What are the features of a civilisation?
4. What classifications do geographers use for different types of settlement, and what makes these different settlements distinctive?
5. Why might it be argued that it is impossible to have a megacity without very good infrastructure? (Could also be a debate: as some huge cities have limited or no significant infrastructure in their shanty towns or favelas. You might look at Orangi in Pakistan if you wanted the group to carry out some research)
6. Large settlements make the greatest contribution to a national economy. (Debate)
7. Analyse how far is it true to say that a modern country can only be successful if it develops its technological sector.

Chapter 04

Agriculture

This chapter is focused on land use for agriculture and how climate and weather influence farming and the production of food.

Textbook section: 37-48

Aim: To explore how landform, climate and weather impact on agriculture, and the efficiency and sustainability of different types of agricultural activity.

Learning outcomes of the chapter:
Learners will—

- Understand that there are different sectors within agriculture;
- Demonstrate awareness of Pakistan's main crops;
- Recognise the significance of agriculture as an employment sector and contributor to the economy in Pakistan;
- Evaluate the ways that climate and weather influence farming and the production of food;
- Identify how the availability of resources and issues around climate change and sustainability present challenges for the agricultural sector and food security;
- Use specialist terminology.

Lessons 1-2 Why is Agriculture so Important?

Textbook section: 4.1 Agriculture, pages 37-48.

Aim: To understand the significance to the Pakistani economy of agriculture as an economic sector and source of employment.

Lesson 1 What Types of Farming are there?

Textbook section: 4.1 page 38.

In the preview ask pupils what we mean by agriculture: use your classroom board to record their suggestions. Point out that there are several different branches of agriculture. Read and discuss the opening section of page 38 ('How big a contributor is agriculture to Pakistan's economy?') with the class, as far as, and including the 'Did you Know?' panel.

Ask pupils to write down the title: How does agriculture contribute to Pakistan's economy? And to answer these questions in their notebook.

A. What is the origin of the word agriculture?
B. What percentage of the country's GDP comes from agriculture?
C. What percentage of the national exports come from agriculture?
D. What percentage of the national workforce are employed in agriculture?
E. How much of Pakistan's land is used for agriculture?

What terms do geographers use to classify farming types?

Activity 1

Read the middle section of page 38 ('What sorts of farming models are there?', and point out or read the definitions on page 37)

Ask pupils to complete the following:

I. In the past many families were subsistence farmers…
II. Today farming is less likely to be subsistence farming except in remote places. It is more likely to be…
III. This can be quite intensive, this means….
IV. Arable farming is ….
V. Livestock farming involves…
VI. Someone who is a mixed farmer….
VII. Truck farmers….

How can we decide what sort of agriculture is possible in particular locations?

Activity 2

Now read and discuss the remainder of page 38. It is not essential for learners to write down extensive information in the table here. What they need instead is a sense of the six items which contribute to whether land is suitable for particular crops, and whether the farmer has the skills to be successful. The 'To Discuss' panel can be used as a focus for discussing the six different elements.

Optional Home Learning

to ask someone at home what they know about farming in Pakistan. Perhaps family members work in agriculture or there are connections to a particular part of the food production industries.

In your plenary remind them that lots of the people of Pakistan are connected to work in agriculture in one way or another. This is gradually changing as mechanisation and 'big business' methods are being introduced to increase production and crops- and, of course, profits for the farmer, since the food industry has to make a profit to operate.

Lesson 2 What Agricultural Challenges does Pakistan Face?

Aim: To explore the challenges that the agricultural sector face in Pakistan.

In the preview link back to activity 2 from the last lesson, which suggested six different factors influenced the likelihood of success for farming. Did they feel any of the six (Tradition, Soil, Climate, Gains (benefits), Stock, Risks (threats) might be more influential?

Activity 1

Read and discuss the first half of page 39, 'What agricultural challenges does Pakistan face?

This presents a series of challenges for food supply in Pakistan. You could then use the 'To Discuss' panel to ask if they think government should intervene, or if it should leave the sector alone and let market forces determine what happens?

Decide if you wish pupils to write down any of these points.

Activity 2

Now read the 'Some big issues to debate' section with the class, which presents a whole series of issues that the food industry and government has to consider. The next 'To Discuss' panel suggests that population, technology, climate and topography all have impacts of choices about agriculture- use this range to explore what the issues are, problems for both the agriculture sector and for politicians in ensuring that food quality is good, and that the supply of affordable, high quality food is managed carefully.

Decide if you wish pupils to write down any of these points.

Optional Home Learning

You could ask pupils to write about one of the 'big issue' topics and to ask a family member what they think. How for example does a family member feel about food prices, how far chemicals are used to control pests, or whether their vegetables are organically grown?

In your plenary explain that a farmer is like any business person, they have to work out if their animals or crops will achieve a final market price that justifies the effort, and any cost, involved until they are sold. They have lots of issues to deal with, like many businesses, but food is particularly important because we all need it, and it is a major element of Pakistan's economy, and the major export industry.

Lessons 3-4 What are Modern Agricultural Practices?

Textbook Section: 4.2, pages 40-41.

Aim: To develop knowledge of modern methods in agriculture and identify how technology assists the sector.

Lesson 3 Mechanisation of Agricultural Processes

Textbook section: page 40.

In the preview explain that we will look at how farmers are using modern technology to try and help deal with some of the uncertainties they face or tasks which can be dealt with efficiently by modern machines- provided the machine means more or better crops and so that the new tool can pay for itself.

How do modern farmers use technology to be more efficient?

Activity 1

Read and discuss the opening paragraph of page 40 with the class, and then the 'Mechanisation' paragraph.

Ask the group if they know of any machines that farmers use to help run their business, and list their suggestions on the board. Use paper copies, or a computer presentation, to show images of different types of farm machinery. Ask the group: What do the different machines do? And: How much difference would they make compared to earlier methods or ways of doing things? Discuss what they suggest, and why solving particular issues might be more urgent than others.

Use the information from page 40 to complete the first part of a table like this:

Modern approaches to assist farmers	
Mechanisation (explanation here)	(Examples here)

Further Use of Modern Solutions

Activity 2

Now read the other two sections on page 40 'Use of Information technology' and 'Synthetic fertilisers.' Discuss the contents, and ask pupils to add to their tables – also drawing on your presentation/images and information you have provided.

Use of Information technology	
Synthetic Fertilisers	

In your plenary summarise the reasons why farmers need to modernise.

Lesson 4 Agricultural Challenges and Solutions.

Textbook section: page 41.

Aim: To further our knowledge of modern farming.

In the preview link to the previous lesson, and say we will continue to reflect on how farmers are using technology to improve yields, efficiency and crop/product quality.

How do innovations in Chemistry, Engineering and Geography improve Farming?

Activity 1

Ask the group to read and discuss both the Chemical Pesticide and Modern irrigation systems paragraphs

Ask pupils to explain to you how knowledge of Chemistry, Engineering and Geography help the people who design equipment for farmers. Tell them to use the information to add further rows into their table in their notebook:

Chemical pesticides	
Modern irrigation systems	

Activity 2

Now read and discuss the 'Problems related to agriculture' and 'Do modern agricultural methods influence climate change?' paragraphs. Ask pupils why the revolution in mechanisation that has started might accelerate climate change. See whether they can make causal links- for example animal waste creates methane in the atmosphere; animals bred for meat and dairy consume a lot of cereal crops and are a relatively inefficient source of protein; and the more machines are used the more fuel is needed. There might be solutions to this of course…

Optional Home Learning

Pupils might be asked to find out what environmental groups think about agriculture and whether it is climate friendly, or a climate frightener! See, for example How does agriculture contribute to climate change? (worldfuturecouncil.org).

In your plenary summarise how technology helps farmers, but can also bring its own challenges- the threat of resistance to pesticides, the over-use of antibiotics with farm animals and the risk of them ceasing to work, chemicals and animal waste getting into the water table, and so on.

Lessons 5-6 Agriculture and Commercial Fishing in Pakistan

Textbook section: 4.3, pages 42-43.

Aim: To recognise the significance of agriculture as an employment sector and contributor to the economy in Pakistan.

Learning outcomes: Learners will-

- Understand that there are different sectors within agriculture;
- Demonstrate awareness of Pakistan's main crops;
- Recognise the significance of agriculture as an employment sector and contributor to the economy in Pakistan;
- Evaluate the ways that climate and weather influence farming and the production of food;
- Identify how the availability of resources and issues around climate change and sustainability present challenges for the agricultural sector and food security;
- Use specialist terminology.

Lesson 5 Agriculture in Pakistan

Textbook section: 4.1, page 41.

In the preview explain that we will look at the details of agriculture in Pakistan, today looking at horticulture and livestock farming, and in the next lesson the fishing industry.

Horticulture and Livestock farming in Pakistan

Activity 1

Read and discuss the two sections, 'Horticulture' and 'Livestock farming' at the top of page 42.

Decide which aspects of the text you would like pupils to write into their notebooks to extend their knowledge and understanding.

Irrigation in Pakistan

Activity 2

Look at the map on the lower half of page 42 which shows the levels of irrigation across Pakistan. Ask the group what observations they would like to make about what is shown. Discuss what this means at a local level, and show images of irrigation in use in farms in Pakistan to give a stronger sense of what this means in practice. Look carefully at the river routes and ask the group to look at a climate map for Pakistan to compare the two, and reflect on how /why irrigation is needed.

Optional Home Learning

You could ask the group to research what is being projected about water supply in the medium and longer term, and what scientists are saying about the supply of mountain meltwater/rains to replenish Pakistan's rivers. For example:

Pakistan's Water Crisis – The Diplomat

Pakistan Institute of Development Economics (PIDE) report: "Water Crisis in Pakistan: Manifestation, Causes and the Way Forward."

In your plenary summarise the key learning around technical terms, and irrigation.

Lesson 6 Commercial Fishing and Pisciculture

Textbook Section: 4.1, page 42.

Aim: To develop knowledge of the fishing and pisciculture industries in Pakistan.

In the preview link back to the pervious lesson and what was learned about horticulture and agriculture in Pakistan. Explain to the group that they will read page 42 (and other sources you provide/link to/show)

And write a short report to explain the key details about these industries.

Requirements for the report: Briefing on expectations

Activity 1

Tell the group:

- How much time is available*
- How the time will be divided;
- Your success criteria for the work and how it will be assessed;
- Provide time for reading of information/research phase. As home learning: Writing-up time

Activity 2 Reading of information/research phase

Activity 3 Home learning: Writing-up time

This could be extended into an additional lesson or lessons should you wish and adequate resources be available.

Plenary

In your plenary praise the positive work habits which you saw while they were researching/writing-up their work.

Lessons 7-8 Arable, Fruit and Nut Farming in Pakistan

Textbook section: 4.4, pages 44-45.

Aim: To look at a series of case studies of farming and food production in Pakistan.

Learning outcomes: Learners will-

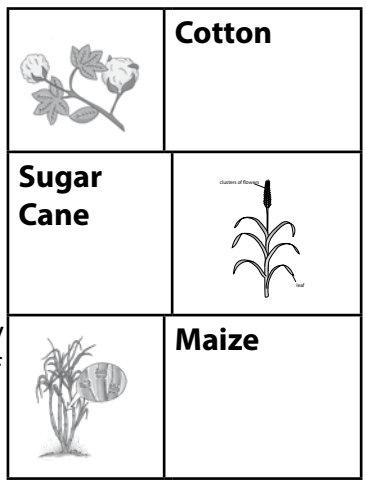
- Understand that there are different sectors within agriculture;
- Demonstrate awareness of Pakistan's main crops;
- Recognise the significance of agriculture as an employment sector and contributor to the economy in Pakistan;
- Use specialist terminology.

Lesson 7 Arable Crops in Pakistan

Textbook section: 4.4, page 44.

In the preview explain that the groups are going to use ICT to design part of a travel guide for Pakistan. If you have a travel guide (or can borrow one from a library or colleague) you could show it, and explain that there are pages about regions, with maps, places to visit, details of where to stay, things to see and so on. There will also be a section on the transport system of the place, its cultural habits, language and way of life. These guides are used by business people as well as tourists, so details of the main businesses and economy are provided in some guides. They are going to use desk-top publishing software (e.g. Microsoft publisher) to design the layout of some pages about arable, fruit and nut farming in Pakistan.

Introducing arable farming



Activity 1

Read the opening section of page 44 together and then discuss how much of this sort of information might be included in a travel guide. Then look at the entries on Cotton, Sugar Cane and Maize on page 44. Discuss whether there is enough information here for the guidebook and what else might be needed.

The group might suggest photographs or drawings of the items grown which is interesting and text, which provides current facts about production or quality of product or perhaps information about where the crop is grown in Pakistan, if it commands a high price in the country or is sent for export and so on.

Decide if your class will work as individuals or as teams, and tell them how much working time they have and how long the guide book entries need to be to keep the Editor and the publishers happy.

Perhaps read a small excerpt from a travel guide as an example, project a copy onto the board or provide it in photocopied form to model the styles and tone which guidebooks take.

Allow the group time to research and write their entries

In your plenary explain there will be further writing and editing time in the next lesson.

Lesson 8 Rice, Oil Seeds and Fruit

Textbook Section: 4.4, page 45.

Aim: To continue to consider examples of food sector industries in Pakistan's agricultural sector.

In the preview briefly link back to the task and restate the success criteria and requirements.

Activity 1

Ask individuals/ the group to use the information on page 45, and other information which they researched to add to their guidebook entry.

Optional Home Learning

For either lesson could be to research one or more of these food industry sectors to acquire suitable information or images

In your plenary again praise the positive research and design work habits you have seen while they were working. Explain how they can see each other's work and celebrate the high quality work that has been achieved (perhaps available to see in a break time/lunch break, or uploaded to a shared ICT workspace)

Lessons 9-10 Livestock Farming in Pakistan

Textbook section: 4.5, pages 46-47.

Aim: To develop knowledge of the livestock sector in Pakistan's economy.

L**earning outcomes:** Learners will-

- Understand that there are different sectors within agriculture;
- Demonstrate awareness of Pakistan's main crops;
- Recognise the significance of agriculture as an employment sector and contributor to the economy in Pakistan;
- Use specialist terminology.

Lesson 9 Animal Farming as an Agricultural Business.

Textbook section: 4.5, page 46.

In the preview explain that we will now look at a further sector of the economy related to agriculture: livestock farming.

The livestock sector

Activity 1

Together read and discuss the opening section of page 46 down to the 'Did you Know?' panel on page 46.

Ask pupils to write the chapter title in their notebooks and then to answer these questions:

1. Why is producing meat more expensive than producing arable and fruit crops?
2. What is the size, as a percentage of agriculture overall in Pakistan, of the livestock sector?
3. What do we mean by the term sustainability, and why is it important to consider in the livestock industry?
4. Are all livestock intended to provide meat or dairy products? Why?

Livestock as a source of power

Activity 2

Now read and discuss the remainder of page 46, beginning with the first, and ending with the second, 'Did you Know?' panel.

1. What animals are classed as ungulates and why are they useful in non-mechanised farms?
2. Why do buffalo and oxen prefer valley life, and cows live more flexibly?
3. What other animals would you see working in farming in Pakistan?
4. What is likely to happen to animal power gradually during your lifetime?
5. Is this likely to be good for the environment? Why?

Optional Home Learning

To find images of animals working in farming roles in Pakistan and reflect on why they are a very useful part of any rural or remote farm.

In your plenary summarise the key points about the importance of livestock farming to Pakistan's agricultural sector.

Lesson 10 Smaller Livestock: Sheep, Goats and Poultry

Textbook section: 4.5, page 47.

Aim: To identify that smaller scale farming often involves some arable and small animal farming, and understand that much of the wealth of small village farmers is represented by their stock of animals.

In the preview explain that although there are some very large agricultural businesses emerging in Pakistan, that middle sized, and small farming businesses are much more common, and that in less-urbanised and more rural/remote areas a family business is the normal model: a family growing some crops and looking after some animals, and using a few animals to help put their carts and other items.

Therefore, many of Pakistan's farmers have a mixture of a few small ungulates: sheep and goats for milk and meat, and perhaps hair and wool, and perhaps some poultry. Explain the terms 'free-range' and 'battery farming'

Small scale farming with fmall ungulates and poultry

Activity 1

With the class, read and discuss the top half of page 47, and then the 'Did you Know?' panel in the middle of the page. Then answer these questions:

1. What are the features of sheep and goats that make them 'small ungulates?'
2. Why are sheep and goats suitable for more difficult and less productive land?
3. What products could a farmer get from these small ungulates over their lifetime?
4. How long has humanity farmed the two small ungulates?
5. What products, which do not require killing the animals, are used to make clothes and carpets?
6. Which animals are bred and kept in flocks as part of the poultry industry?

Activity 2 How is agriculture changing?

Read this part of page 47, discuss the contents and then the 'Did you Know?' panel at the bottom of the page.

Then answer these questions:

1. How did The Agricultural (or Farming) Revolution, that began in c.1700 CE, change farming practices for innovative farmers?
2. How are technology and mechanisation changing the farming industry?

Optional Home Learning - To further research livestock or pisiculture farming in Pakistan.

In your plenary summarise how technology is changing life on large farming businesses, where there might be shareholders and investors, and therefore that investment is possible on a large scale. Ask what impact more products at higher quality might mean for small scale farmers and the environment. Ask the group to think about whether (and at what level) there is a healthy balance between protecting the planet and giving people the foods they want at an affordable price.

Answers for the end of unit recall questions

Section 1: Quiz Questions

1. In Pakistan arable farming is a large-scale employer and can be labour intensive unless the crop farmer can afford mechanized approaches. Solid crops need irrigation often and pesticides are heavily used. (page 41).
2. Some of the problems related to agriculture in Pakistan include lack of capital investment; over dependence on single markets; low vegetable consumption; falling land productivity; food going to export instead of home markets; farmers opting for the easiest crops to grow; and consumer choices (page 39).
3. Traditional farms use river water in channels for irrigation, whereas modern drip-fed pipes are used where investment has allowed a more advanced and efficient approach (page 41). [Students will construct their responses based on what they have learnt in this chapter.]
4. Some of the threats to the natural environment due to farming include chemical pesticide and fertilizer use which risk pollute the water table, kill beneficial insects and other creatures and also impact on human health. Livestock are over-dosed with antibiotics leading to germ-resistance (page 41).
5. Agriculture changed during 'the farming revolution' by moving to a more scientific approach. Selective breeding improved livestock, crops were grown which were suitable to the conditions leading to greater productivity and farm machinery was introduced and developed (page 47).
6. Subsistence farming means just about growing enough to survive as a family, (page 38) whereas livestock farming means keeping herds of animals on a larger scale (page 37).
7. 10% of the world's cotton is grown in Pakistan (page 44).
8. Students will do the map activity.
9. Agricultural yield is shaped by pests, diseases, weather, water supply, nutrients and competition (from weeds/other animals for food/water) (page 41).
10. Research based question.

Section 2: Multiple Choice Questions

1. The term arable farming relates to: B. Growing crops (page 37).
2. A. Heavy use of land. (page 38).
3. A. (page38).
4. The term Pisiculture relates to: A. Farming fish commercially (page 43).
5. A. 1058 km of coastline (page 43).
6. none of these. A is the closest option. The reason is the pesticides kills beneficial organisms, along with the pests.
7. A. Karachi, Korangi, Pasni, and Gwadar. Lahore, Islamabad and Faislabad are land-locked.

Opportunities for Longer Prose Responses, Debating and Extended Writing

1. In what ways is the fishing industry an important, but often forgotten contributor to Pakistan's agricultural economy?
2. Is it true that "Modern agriculture is a significant threat to the wellbeing of the ecosystem in Pakistan"? (Debate)
3. "Government needs to grasp the nettle and better support farmers in understanding, investing in and adopting high tech, sustainable farming." (Debate whether you agree.)
4. With 85% of Pakistan's export based on agriculture: is this a good or bad sign for the economy overall?
5. 42% of Pakistan's workforce are in agriculture or agriculture related trades. What does this tell us about the agriculture sector?
6. Using examples, show how different sorts of agriculture are important across the country as a whole, and how the agri-businesses and food production industries of Pakistan are very diverse.
7. If you were advising the Minister for Agriculture and Food about how best to modernize Pakistan's farms, what would you suggest the priorities should be for the first three to five years?
8. How do ecosystem, climate and landform shape what sort of food production can take place in the differ
9. A. Korachi, Korangi, Pasni, Gwadarent parts of Pakistan?
10. How might the changing availability of water over the next 20-50 years in Pakistan, and global warming-climate change need to ring alarm bells now for Pakistan's food and water supply chains?

Chapter

05 Climate Change

This chapter is focused on understanding the role of the greenhouse effect and global warming in causing climate change, and on considering the threats climate change presents for the world ecosystem and for Pakistan and its people.

Textbook Section: pages 49-56

Aim: To deepen knowledge of the nature of the geographical-scientific causes and consequences of climate change and of the terminology used in describing the problem.

Learning outcomes of the chapter:
Learners will—

- Define climate change and explain its cause and consequence;
- Recall the difference between climate and weather;
- Explain the function of the ozone layer;
- Explain the greenhouse effect and its significance;
- Use specialist terminology.

Lessons 1-2 Why do people talk about a climate crisis?

Textbook Section: 5.1, pages 50-51.

Aim: To ensure the specialist terminology describing global warming is understood and correctly used.

Learning outcomes: Learners will-

- Define climate change and explain its cause and consequence;
- Recall the difference between climate and weather;
- Explain the function of the ozone layer;
- Explain the greenhouse effect and its significance;
- Use specialist terminology.

Lesson 1 What is the difference between climate and weather?

Textbook Section: 5.1, page 50.

Aim: To understand how the depletion of the Ozone layer is changing long-term weather patterns (Climate) due to global warming.

In the preview ask the group what they hear about on TV, or read about on the internet/in other places around 'The climate crisis.' Ask: What does it mean and why organisations like the United Nations are concerned that urgent action is not being taken fast enough? Do they recall studying this in science or in Geography in grade 6, and where was it mentioned this year?

Explain that we will revisit the climate crisis now and over the next few lessons because it is the most significant environmental problem of several big challenges that humans have created.

What is the difference between climate and weather?

Activity 1

Read the opening text on page 50 with the class and discuss it and the passage 'What is the difference between climate and weather?' Draw pupils' attention to the diagram showing the labels scientists use to describe the atmospheric layers above us (top left on page 50), we live in the troposphere, and sometimes cross into the stratosphere for flights.

Ask pupils to write the title 'What is the difference between climate and weather?' in their notebooks, and then to answer the question.

What is the ozone layer?

Activity 2

Now read and discuss the 'What is the ozone layer?' section to the end of page 50.

Ask them to write the title, and to explain

1. What is meant by 'ozone layer' and what is its normal function?
2. Why is there a problem with the ozone layer?
3. What is a CFC and why has the uses of these gases been largely banned?
4. Where is the ozone layer at its most degraded, and why is this worrying?

Optional Home Learning

Using the 'Did you Know?' panel on page 50 set up a home learning where the pupils will think about, and possibly take the opinions of others on, why dealing with 'invisible' problems, and getting society to change its behaviours in such cases is especially challenging.

You could show a picture of a small kitten, and talk about how advertising for charities use images carefully to attract the viewers' attention in TV and online adverts. Visible things which 'pull at your heart strings' make it easy to get someone's support.

The same approach is taken by media influencers and 'personalities' on web sites, where something that is believed to 'catch the attention' of or appeal to particular demographics (groups), and images are carefully used to create what advertisers call click-bait. We are seemingly vulnerable to particular things for evolutionary and cultural reasons: for example baby photos appeal to humans because we are predisposed to feeling sympathetic to small children as a communal and evolutionary trait.

Ask pupils to write something which responds to the 'Can you explain why environmental problems might be particularly difficult to solve if they are 'invisible'.

In your plenary sum up the key points about the depletion of the Ozone layer, and how it is impacting on planetary warming.

Lesson 2 What is the impact of the damage to the Ozone layer?

Textbook Section: 5.1, page 50.

Aim: To further explore climate change and identify how 'greenhouse gases' are contributing to global warming.

In the preview link back to last lesson and the work on understanding what the ozone layer's function is as part of the atmosphere. Explain that we will look at how global warming works, and why climate change is taking place.

Read the first two paragraphs on page 51: 'What is the impact of this damage?' This explains how the Earth is heating up as a result of damage to the ozone layer, and how this is changing the weather patterns and therefore the climate. Ask pupils to write an explanation of why the Earth is heating using the information from these two paragraphs.

What are the greenhouse gases?

Activity 1

Read the section with this title on page 51, and the 'Did you Know?' panel below it, then discuss both

Ask pupils to write Interesting facts about the Greenhouse Gases as a subtitle in their notebooks, and to decide what to write, and then surround what they have written with a coloured border to help it stand out.

What is Global Warming?

Activity 2

Read and discuss the remainder of page 51 with the class. This time they should write the subtitle Worrying facts about Global Warming, then write about what is happening as a result of Global Warming and again add a coloured border.

Optional Home Learning

You could ask the class to look at a specific part of the website of one of the leading environmental charities/ activist groups and comment on a particular aspect or issue. Ensure you check the site is well structured and appropriate for furthering children's geographical understanding, and that there is no pressure placed on site visitors to take on particular views or donate.

In your plenary ask the group if they think they should be changing their own habits to try and adjust to the need to slow global warming. Summarise the learning about the Greenhouse Gases and their impact, and say that in our next lessons we will look at how things are changing now that we know why they are changing.

Lessons 3-4 Why does Global Warming matter?

Textbook Section: 5.2, pages 52-53.

Aim: To understand the significance of global warming and begin to consider the consequences of 'the Greenhouse Effect'.

Learning outcomes: Learners will-

- Explain some of the consequences of Climate Change;
- Explain the function of the ozone layer;
- Explain 'the greenhouse effect' and its significance;
- Use specialist terminology.

Lesson 3 Why does Global Warming matter?

Textbook Section: 5.2, page 52.

In the preview explain that today we will start to look at the 'so what' or significance of global warming and will begin to see what is actually happening globally and nationally. Read the opening paragraph of page 52, and discuss if they think they have seen evidence of climate change in the news on TV, on the internet or in newspapers or magazines.

Why does global change in the climate matter?

Activity 1

Read this section of page 52, which introduces rising sea levels, extreme weather incidents, and the loss of habitats and, by implication, species extinctions.

Ask pupils to write and answer the question: Why does global change in the climate matter? In their notebooks.

Water wars

Activity 2

If you have time: carry out a discussion based on the 'To Discuss' panel on page 52. You could use reputable sources as stimulus for this, for example:

What You Need to Know About the World's Water Wars (nationalgeographic.com)

Warn pupils that if they look online there is also a lot of scaremongering, propaganda and false information being circulated. Help pupils understand how to apply some healthy critical awareness and not to automatically believe everything they read online as a way of promoting cyber-safety and personal discernment to help prevent them from being manipulated or becoming needlessly anxious about the state of the world.

Optional Home Learning

You could set pupils tasks related to reading and reporting on parts of the Ministry of Climate Change's website (access is via the main government web portal)

In your plenary explain that growing awareness of the extent of the climate and environmental crisis should force governments to act and begin to remedy some of the problems. However, this will only happen if the people insist on action to protect both people and planet.

Lesson 4 Does it matter if the ice sheets and polar ice melt?

Textbook Section: 5.2, page 53.

Aim: To explore the implications of habitat and species loss.

In the preview explain that we will look at a case study of how climate alteration is impacting on specific habitats and the species that call them home.

Why is the melting of the ice sheets and polar caps a problem?

Activity 1

Read the first section of page 53, which explains that the Greenland and Western Antarctica ice sheets are melting at an alarming rate. Provide the group with some further information about these ice sheets, and the Polar Regions as habitats and get them to look at pictures of the wildlife which lives on and under these ice sheets and on their margins. Look at (extracts from/edited excerpts- to make them accessible) environmentalists' reports in detail how this habitat is being lost. Ask pupils to write an evaluative response which responds to the 'Does it matter…' question. Perhaps get pupils to start, then pause to ask what the best features of the writing are (rather than being negative and signalling our flaws or things to smooth.

Are there things we can do to stop or reduce climate change?

Activity 2

Now read the remainder of page 53 with the group, discussing anything they wish to as you progress through looking at Solutions and the Net Zero Goal. Decide what you would like them to add to their notebooks from this section, emphasising the points which you think will help them understand the scale of the problem we collectively face.

Optional Home Learning

The 'Going Further' panel on page 53 could be used to form the focus of some research about what the international community has committed to do to slow global warming. Either set pupils the task of researching and summarising what these treaties say, or provide them with a summaries of the Kyoto Protocol and Paris Climate Conference or CoP 26 decisions to use in support of whatever task you set. This might be based around summarising the key commitments and then evaluating, using any evidence available, as to whether we are 'on track' as a global community to meet the targets set in these agreements.

In your plenary summarise how habitat and species loss is going to have an impact on bigger food chains and biodiversity on Earth, and that the extreme weather we have already learnt about in grade 6 and this year will only reduce in severity if we address the negative impact we are having on the planet. Explain tha in thet next lesson we will look at challenges for Pakistan.

Lessons 5-6 Climate change as a challenge for Pakistan

Textbook Section: 5.3, pages 54-55.

Aim: To look at climate change, extreme weather events and possible action to address climate challenges in Pakistan.

Learning outcomes: Learners will-

- Explain how the greenhouse effect is having an impact on Pakistan;
- Use specialist terminology.

Lesson 5 Why is climate change such a challenge for Pakistan?

Textbook Section: 5.3, page 54.

In the preview explain that now we will examine and evaluate the evidence we have of the impact of the climate crisis of Pakistan.

Why will climate change have a big impact on Pakistan?

Activity 1

With the class, read and discuss the information on page 54. Break this down by dealing with the long text as two sections, (Split it at line 12, 'During recent years…);

and consider the graph/bar chart as a further section; then the climate scientist comment as a fourth element.

First text section

5. How are mean temperatures changing in Pakistan?
6. What is the level of rainfall Pakistan experiences?
7. Why is this level considered low compared to national needs, and what problems does this present for farmers?

Second text section

1. Where is the monsoon season rain rising, and falling?
2. What problems does this create?
3. Why is increasing meltwater from the Himalayas causing an immediate problem, and what will it mean when the ice is all melted and has runoff the mountains?
4. What is happening to Pakistan's deserts and arid areas?

The graph/bar chart: (pupils will need help to interpret the temperature graph and rainfall bar chart)

What do longer term temperature and precipitation figures tell us about the changing climate and the extremes of weather that climate change seems to be bringing to Pakistan?

Using the comment from the climate scientist: Ask pupils to write a response to this question-

What do climate scientists expect global warming will do to Pakistan?

In your plenary ask if percentages and measurements, figures and data all help make a problem seem more 'real' and serious, or do they mean that people 'glaze-over' because unless they are specialists "it's all a bit hard to visualise and take in." Explain that getting the message across is remarkably hard as everyone wants to have a comfortable life with 'nice things'. Link back to the earlier discussion about persuading people: maybe mother Polar Bear and cubs on tiny little ice floes is the way to get most people to understand what is happening?

Lesson 6 Does Pakistan contribute to the climate crisis?

Textbook Section: 5.3, page 55.

Aim: To think about whether some countries have more to 'do' in response to climate crisis than others.

In the preview read the text at the bottom of page 54 onto three lines of page 55: 'Does Pakistan contribute to the climate crisis?' Write the key figures on the board as you progress:

Pakistan has:

1% of global greenhouse gases;

2.83 % of the global population.

Ask what they notice about these figures… ask if we should feel responsible for the problem, or pleased that we are less polluting than many other countries? They might argue that we are producing below our 'share' per person of greenhouse gases, so need not worry….

Point out that global warming is not a respecter of 'guilt and innocence', it will continue to heat everyone's climates and bring extreme weather to everyone.

Look at the column or bar chart on the bottom of page 54. Some countries are a lot more involved in adding greenhouse gases to the environment. Should they do more to 'fix' our climate and other environmental problems?

Also point out that at 2% increase in population yearly although there will be 4 million births to dilute the 'share' of Pakistan's pollutants; all of these people will consume resources, need energy (power/fuel) and use food and water. So a rising population worsens the environmental impact we face.

So, we all need to act, or the environmental problems will get worse and worse year on year.

Decide if you wish to ask the group to write down any of these figures and explain their significance, then move on.

What needs to be done to cut greenhouse gas emission?

Activity 1

Read the two points of the 'What needs to be done...' paragraph on page 55

Ask pupils to write the title, summarise the two points and put a coloured border around the summary, but allow space to add a third step (from the bottom of the page) before they add the bottom border. Tell them roughly how much space they will need!

What needs to change in the way we farm?

Activity 2

Now read the 'To Discuss' panel in the middle of page 55, and discuss this briefly, before reading and discussing the three paragraphs below it, and reading the final 'Did you Know?' panel. Ask them to summarise the three paragraphs about helping farmers to be 'greener' and more efficient in no more than three short sentences.

Read Point 3 and ask them to add the point that 'we all need to act' to their summary box- then add the bottom line to close the border.

Optional Home Learning

The 'Going Further' panel could be used as a focus for a home learning activity. Decide whether this will be an open research activity where they have to find information, or if they will be given websites to visit or printed materials to read and will have tasks or questions to help organise their responses.

In your plenary point out that Pakistan will face enormous pressures around basic resources very rapidly, and must take action to protect the people, economy and ecosystem. Tell them that their generation is the one that has to fix this, but that they have the creativity and energy to do so!

Answers for the end of unit recall questions.

Section 1 Quiz Questions

1. a. Troposphere is the lowest region of the atmosphere.
   b. Greenhouse gases are gases in the earth's atmosphere that trap heat and they act like the glass walls of a greenhouse.

   c. the phenomenon of increasing average air temperatures near the surface of Earth over the past one to two centuries.
2. CFCs are chlorofluorocarbon gases, and they are a problem because they deplete the ozone layer above the Earth and this allows more solar radiation, and therefore heat to penetrate the atmosphere (p50).
3. The acceleration of glaciers melting in the Himalayas will impact on Pakistan because it risks flash flooding, property damage and loss of life being more frequent (page 54).
4. mining and agriculture
5. Improving meat and milk yields per animal would be helpful in terms of global warming because fewer animals would be needed to meet demand, and fewer animals means less methane, fewer antibiotics used and less run-off waste. (page 55).
6. Page 53 explains the impact of global warming on polar regions.
7. Research-based question
8. Research-based question
9. Research-based question

Section 2 Multiple Choice Questions

1. The pattern of precipitation and dryness, and temperature and wind in a particular region is: B. Climate (page 50).
2. The daily precipitation and dryness, and temperature and wind at a particular locations is: A. Weather (page 50).
3. CFC is the abbreviation for: B. Chlorofluorocarbons (page 50).
4. The true statement about the greenhouse effect is: A: Greenhouse gases prevent the Earth from cooling (page 51).
5. The item which is not a greenhouse gas is: B. Nitrogen (page 51).
6. The layer of the atmosphere in which all living things exist is called the: A Troposphere (page 50).
7. It is anticipated that: C. 400 million people will face flooding due to rising sea levels in the coming 75 years (page 53).

Opportunities for Longer Prose Responses, Debating and Extended Writing

1. Should tackling global warming urgently matter to the people of Pakistan? (Debate)
2. Why should tackling global warming urgently matter to the people of Pakistan? (Essay or presentation)
3. How is human activity causing climate change?
4. Why and how are the Polar Regions being transformed by 'the Greenhouse effect'?
5. What would your advice be to the President of Pakistan about how to help farmers reduce their impact on the planet?
6. Why is the melting of the glaciers in the mountains a problem for Pakistan?

Chapter 06

Minerals and Power Resources

This chapter is focused on Pakistan's natural rock-based resources: its minerals and rocks, and its power resources: generated by gas, water (hydro), oil, and nuclear fission.

Textbook Section: pages 57-70.

Aim: To explore how extractive industries draw on the geological resources of Pakistan to provide raw materials, minerals and common and precious/semi-precious stones and gemstones; and to explore the nature of power generation in Pakistan.

Learning outcomes of the chapter:
Learners will—

- Name a range of key mineral deposits in Pakistan;
- Identify industries which use Pakistan's minerals and their significance in the economy;
- Explore the nature of power generation in Pakistan;
- Evaluate the environmental credentials of different types of fuels;
- Use specialist vocabulary.

Lessons 1-3 Mineral Extraction: A Primary Industry

Textbook Section: 6.1, pages 58-60.

Aim: To understand that extractive industries are an important part of exploiting Pakistan's natural geological resources which provides employment, revenue and raw materials to the economy.

Learning outcomes: Learners will-

- Identify mineral extraction as a primary industry;
- Use specialist vocabulary.

Lesson 1 What makes Mineral Extraction a Primary Industry?

Textbook Section: 6.1, page 58.

In the preview show a random, low value rock and ask if anyone wants to make you an offer, perhaps a large offer in money for this rock? Would they like to examine the merchandise? Perhaps they would like to handle it and think what they might do with it if it were theirs? Might they put it on display, or give it to a craftsperson to turn it into something exquisite? No?

Then show a picture of a precious stone or mineral from Pakistan. What about this item, is this of more interest? In turn show several different images of different minerals. Discuss what is it that makes some things expensive and desirable and others commonplace and (almost) worthless?

Explain that today and for several lessons we will consider minerals as an important aspect of geography.

What is a mineral?

Activity 1

Together read the top section of page 58 where the two figures are drawn. This defines minerals, explains their nature and explains how a study of rocks can be classed as geology, petrology, or mineralogy.

Decide which elements of this information you want learners to write into their notebooks, and allow time for this to be completed.

Extractive Industry in Pakistan

Activity 2

Now read the four following paragraphs to the 'To Discuss' panel on page 58.

1. Who oversees mineral extraction in Pakistan?
2. Are minerals always found in solids (rock or dust) form?
3. What is the difference between a primary and a secondary industry?
4. Why do some minerals have a greater value than others?

Optional Home Learning

The 'Going Further' task could be used as the basis for home learning, but the pupils will need some steerage around what you would like them to look at and record.

In your plenary draw together the key points about today's lesson: the nature and definition of minerals, their importance for production of a range of things and the role of extraction in the national economy.

Lesson 2 Which minerals are found in Pakistan?

Textbook Section: 6.1, page 59.

Aim: To identify some of the minerals found in Pakistan's landmass, and to examine some of their characteristics and uses.

In the preview explain that today we will look at different types of mineral and rock types extracted from Pakistan.

The geology of Pakistan

Activity 1

Make a presentation about the nature of Pakistan's geology, and show pictures of the things you mention to help pupils begin to recognise rock and mineral types and place terms against visual references. You could use a classroom display, or a computer-based presentation to share the key information. There are excellent online materials which summarise the nature of local geology which are accessible for grade 6 learners, so choose something which you feel will capture pupil curiosity and offer the right level of factual context for what you want learners to know. Decide what you would like them to write into their notebooks and whether you wish them to have any images to stick in. A coloured geological map would be useful to talk about geological time and how the landmass of Pakistan has been constructed over millions of years, and what has changed.

Read the opening paragraphs on page 59, which explain that Pakistan sits largely on beds of limestone, and that much of this rock is of interest in construction worldwide because of the quality of the minerals. Decide if you want pupils to record any of this information, and if so how you would like to structure it in their notebooks.

Minerals and Rocks in Pakistan

Activity 2

Now read the panel on page 59 listing some of the most common minerals/rock deposits in Pakistan. It would be very useful to link the discussion of these with images and the map on page 60, which shows where in the country the deposits are situated. Again a short film or presentation will give additional depth to the discussion of different raw materials that are being mined and collected around the country.

Discuss what they know about the financial value of some of these products, and how difficult they are to extract from the ground: which are very good return for the effort/take little in the way of resources to acquire and which are more dangerous to extract, or require considerable investment/care and expertise to track and find, for example precious stones, where a lot of waste rock is removed to achieve, bringing small but potentially high value products to market.

Optional Home Learning

Set a task finding out about one of the particular types of extractive industry, for example salt mining at Khewra, or Sulphur production in Balochistan. Or ask pupils to create a report or poster about the semi-precious and precious stones that are mined in Pakistan.

In your plenary sum up what we have learned about the production of different mineral raw materials in Pakistan.

Lesson 3 Using Maps as a data source

The Location of Mineral Deposits in Pakistan

Textbook Section page 60.

In the preview explain that specialist maps are very useful sources of data and that a range of information is used to create things like geological maps, mineral deposit maps and others. Show a short presentation about how maps are made

The US Geological survey has a range of different sorts of maps USGS Mineral Resources On-Line Spatial Data and this site explains in outline about identifying where mineral deposits are found, for example:

Finding and Assessing Mineral Resources - Video & Lesson Transcript | Study.com

Reading the Mineral Deposits Map

Activity 1

Look at the minerals map with the group on page 60,

Discuss what is being shown and set some questions for written and verbal responses to help diagnose

whether learners understand and can interpret the map.

You could provide a blank map of Pakistan of a similar scale to pupils, and ask for data to be transferred onto their copy, and then a written summary to be made explaining Pakistan's mineral deposits.

In your plenary talk about who might use mineral maps, and why they are important documents.

Lessons 4-6 Fossil Fuel Extraction in Pakistan

Textbook Section: 6.2, pages 60-61 and 6.3, pages 62-63.

Aim: To understand what reserves of fossil fuel exist, and where they are located in Pakistan; to know the challenges and benefits associated with extracting the fuel and its use in the national economy.

Learning outcomes: Learners will-
- Identify the source of key fossil fuels in Pakistan;
- Explore the nature of power generation in Pakistan;
- Evaluate the environmental credentials of different types of fuels;
- Use specialist terminology.

Lesson 4 Using Maps as Sources of Data : Fossil Fuel Extraction

Textbook Section: 6.2, pages 60-61 and 6.3, page 62.

Aim: To understand what reserves of fossil fuel exist, and where they are located in Pakistan; to know the challenges and benefits associated with extracting the fuel and its use in the national economy.

In the preview explain that a modern economy requires power to support homes, industry and business operation and that with a growing population and business sector, and mechanisation of traditional industries such as farming, there is an increasing demand for power. Explain that over the next lessons we will look at the extraction and use of fossil fuels and alternative energy supplies.

What are fossil fuels?

Activity 1

Read the opening paragraph on page 61 'What are fossil fuels?'

Ask pupils to write a definition of fossil fuels in their notebooks and to place a coloured border around the definition.

What are Pakistan's energy reserves and where are they located?

Activity 2

Explain that an energy reserve is the amount of fuel that a country holds. Some of this might be 'in the ground': not yet extracted fossil fuels, or might be potential energy, for example stored in a large water river and mountain reservoir being held back by dams for use in hydro-electric power (HEP) generation, and wind generators.

This briefing paper from the IAEA (International Atomic Energy Agency, of the UN) provides some useful evaluative comments about Pakistan's energy reserves: Pakistan 2020 (iaea.org) based on statistics provided

by Pakistan's government, or the U.S. International Trade Administration's (ITA) Energy Resource Guide Energy Resource Guide - Pakistan - Oil and Gas (trade.gov).

Provide pupils with a blank map of Pakistan, and ask them to make a copy of where the fossil fuel and HEP reserves are found, then describe what is available in a written summary in their notebooks. Some of the ITA figures or others from Pakistan's government website could be represented in pupil notebooks as pie charts or bar/column charts to summarise the energy generation needs and levels in Pakistan.

Optional Home Learning

You could set pupils the task of finding out more statistical information about the energy needs and resources of Pakistan.

In your plenary summarise what sorts of energy reserves Pakistan has, and describe the distribution of resources around the country. Ask: based on what they know about landforms and topography of Pakistan, is extracting this fossil fuel going to present any challenges? Explain that we will explore this in the next lesson.

Lessons 5 and 6 Fossil Fuel Extraction Coal

Textbook Section: 6.2, pages 60-61, and 6.3, pages 62-63.

Aim: To identify and evaluate mineral extraction techniques in the coal industry in Pakistan;

In the preview explain that today we will look at the extraction of coal in Pakistan, examining the Primary Industry of Coal Mining. Ask the group to remind you what is meant by primary, secondary, tertiary and quaternary industries.

In the preview explain that today we will look at the extraction of coal in Pakistan, examining the Primary Industry of Coal Mining. Ask the group to remind you what is meant by primary, secondary, tertiary and quaternary industries.

Coal Extraction

Activity 1

With the group, read the 'Coal' and 'Significance of coal' sections on page 62, then ask them to answer these questions:

Coal

How old are Pakistan's coal deposits?

What are the characteristics and drawbacks of brown coal as a fuel?

Where in Pakistan are coal deposits?

The significance of coal as a fossil fuel

What are the benefits to Pakistan's economy of coal as a fuel?

Mining methods

Activity 2

Now look at the Mining Methods diagram and the Opencast mining or quarrying and Deep Shaft Mines explanations with the class and discuss the approaches used. If you are able to do so, show some further images of mining in Pakistan to illustrate these explanations. Ask pupils to draw a diagram to show both deep and opencast mining, and to explain the two mining methods in writing in their notebooks.

Optional Home Learning

You could ask learners to research coal mining methods in Pakistan.

In your plenary explain that coal mining is not a long established extractive industry at most of Pakistan's coalfields, and that in our next lesson we will explore the benefits and challenges of coal mining for Pakistan's people and economy.

Lesson 6 Coal Mining in Pakistan: Gains and Challenges

Textbook Section: 6.2, page 61 and 6.3, page 63.

Aim: To consider why coal mining brings both challenges and benefits to Pakistan.

In the preview explain that in today's lesson we will look at how coal mining is a (relatively) easy to acquire fuel, but also presents practical and environmental challenges.

Coal: A benefit for the economy?

Activity 1

Read the opening paragraph and 'Did you Know?' panel at the top of page 63, and the 'Potential Total Yields' table in the middle of the page. This explains mine ownership, the larger users of the coal, and the quantity and potential of the coalfields.

Ask pupils to write a short comment on why the coalfields offer a benefit to Pakistan's economy.

Difficult Choices

Activity 2

Now read and discuss the 'Difficult Choices' paragraph with your class. This poses a series of questions which politicians, landowners, investors and power industry leaders have to make. Look in particular at the example of the Kingri coalfields and ask pupils to decide if the benefits of opening up the location for development has been 'a good thing'? The 'To Discuss' panel raises the issue of who is working in the coalfields (and by implication possible working conditions and where the pay might be going), and raises further interesting questions for consideration.

Optional Home Learning

You might ask pupils to look at what environmentalists and others say about the environmental impact of coal mining.

In your plenary summarise the challenge of balancing economic and environmental needs around extractive industries

Lessons 7-8 Oil and Gas Extraction

Textbook Section: 6.4, pages 64-65

Aim: To identify how oil and gas are extracted and processed.

Learning outcomes: Learners will-
- Identify the location of oil and gas deposits in Pakistan;
- Explore the nature of power generation in Pakistan;
- Evaluate the environmental credentials of different types of fuels;
- Use specialist vocabulary.

Lesson 7 The Extraction of Oil and Gas

Textbook Section: 6.2, pages 60-61, and 6.4, page 64.

In the preview explain that we will look at two further types of fossil fuel during this lesson: oil and gas. Ask if they remember where in Pakistan there are oil and gas deposits, then together look at the map on page 61.

How were the oil and gas deposits formed?

Activity 1

Now read the top section of page 64 with the class and discuss how these fossil fuels were created. Ask them to write down in their notebooks how fossil fuels were laid down as layers on the surface of the Earth, and then covered up by other layers.

How is the oil and gas extracted?

Activity 2

Read the remaining text on page 64 and look at the diagram, discussing both with the group.

Explain any words which might be unfamiliar to the group, for example seismic survey, crude oil, deep drilling, dry well and gusher.

Show the pupils a suitable film, and/or show photographs, about oil and gas production in Pakistan. The pupils should now explain how oil and gas are found, extracted and refined.

Optional Home Learning

Pupils could be set a task of finding out more about land based oil and gas extraction in Pakistan.

In your plenary sum up the key points about land exploration (surveying) for oil and gas, and the expensive and time-consuming stages that go into setting up oil and gas mining stations. A very large and complex set of infrastructure is needed to refine (improve) the oil or gas and several by-products can be created. Explain that next lesson we will look at the process involved when exploration and extraction is at sea- an even more challenging set of problems for companies involved.

Lesson 8 Ocean Extraction

Textbook Section: 6.4, page 65.

Aim: To understand how extractive industries in the energy sector operate at sea.

In the preview explain that we will build on our last lesson, where we looked at oil and gas extraction on land by looking into gas an oil extraction at sea.

Ocean Extraction

Activity 1

Read the first section on page 65, which explains briefly how oil rigs are deployed. Show the group a presentation about Pakistan's oil industry and refineries and discuss the problems that will occur as a result of drilling for oil and gas at sea. Look at photographs of gas and oil rigs and diagrams showing how drilling takes place.

What are the economic risks of oil and gas?

Activity 2

Read the middle section of page 65, which explains how speculative prospecting for oil and gas, even informed by geological surveys, is an expensive and might not result in the discovery of fossil fuels.

Decide what you would like pupils to write in their notebooks.

Has there been success in finding oil and gas in Pakistan?

Activity 3

Read the final section of page 65, which explains where the oil and gas reserves of Pakistan are located. You could show a map of oil and gas rigs off the coast of Pakistan.

Optional Home Learning

Ask pupils to research shale oil and shale gas extraction, and identify why there is a lot of opposition to the extraction of both (because fracturing the shale is an explosive process which has been linked to triggering earthquakes).

In your plenary summarise the learning from the session, and explain that we will move from looking at primary industries acquiring raw materials to secondary industries which generate power in our next session.

Lessons 9-12 Power Generation: A Secondary Industry Sector Activity

Textbook Section: 6.5, pages 66-69.

Learning outcomes: Learners will-

- Name a range of key mineral deposits in Pakistan;
- Identify industries which use Pakistan's minerals and their significance in the economy;
- Explore the nature of power generation in Pakistan;
- Evaluate the environmental credentials of different types of fuels;
- Use specialist vocabulary.

Lesson 9 How does Mineral Quality Impact on the Energy Industry?

Textbook Section: 6.5, page 66.

In the preview explain that we will look in more detail today at how the quality of coal reserves impact on use and power generation. Begin by reading and discussing the opening paragraph on page 66 with the class. This makes the distinction between fossil fuel extraction: a primary industry; and power generation, which is classed as a secondary industry, and gives other examples of secondary industries.

Classifications of industry types

Activity 1

Ask pupils to explain in their notebooks

1. Why are fossil fuel extraction and fossil fuel related power generation placed in different industry type classifications (primary/secondary)?
2. What is meant by the term renewable energy, and which types of power generation are classed as renewable?

How does mineral quality impact on the energy industry?

Activity 2

Read the remainder of page 66 with the group and discuss the content. This identifies the difference between bituminous (hard-black) and lignite (softer-browner) coals, and raises the dual issues of temperature generation when burned, and pollution levels emitted. Pakistan's coal reserves tend to be lignite coals, and any furnace work or other tasks requiring very high temperatures must draw on imported, higher quality coals.

Ask pupils to write in their notebooks an explanation of:
How does mineral quality impact on the energy industry?

And to make one of the following for each of A or B: pie charts, bar graphs or tables showing:

A. Sources of Electricity Generation in Pakistan
B. Division of Energy use by Sectors in Pakistan

Optional Home Learning

You might ask pupils to visit the website of Pakistan's-

Ministry of Energy, and Pakistan's Mineral Development Corporation- with steerage about what you would like them to look at/find out, since the sites are written for adults and are complex and somewhat inaccessible without help to interpret what is shown.

In your plenary look at the figures for generation and use (bottom of page 66) and reflect with the class what they tell us about how green and how 'future safe' our energy generation is compared to our needs. Explain that in our next session we will look at the energy generation's benefits and risks

Lesson 10 Problems as a result of mineral extraction and energy generation

Textbook Section: 6.5, page 67.

Aim: To look at risk management in relation to power supply in Pakistan.

In the preview explain that we will think about risk management today, and ask what they think this means.

You could draw (or show a picture of) a simple balance and explain that choices always must be made about levels of benefit and risk. Getting risk management right means identifying hazards and preventing them from happening or causing serious problems. Life always involves risk, and random events bring unexpected issues, but we should keepensuring that we do not take unwise decisions or allow risks to become high.

Problems as a result of mineral extraction and energy generation

Activity 1

Read and discuss the top section of page 67 as far as the end of the 'Did you Know?' panel with the class,

Either ask the class to research mine safety records in Pakistan using the internet, perhaps listing specific sites, or provide some printed information for a research desktop activity.

Damage to the environment

Activity 2

Read the remainder of page 67 with the group and discuss if there is any level of acceptable environmental damage- or if some is acceptable if a country and its economy/people need raw materials and resources?

Ask the group what damage they think is being done to the environment by the fossil fuel extraction industries, and to write a paragraph explaining 'the problem', and another with suggested solutions to reduced ongoing damage, and for remedial (fixing) work at former industrial sites.

Optional Home Learning

Set the group the task of looking at a specific website which explains about remediation activity in former industrial sites in Pakistan. The group could be asked to compare what is being done at the world's largest former asbestos mine at Amiantos in Cyprus (See the website of the Troodos Geopark Troodos Geopark - Troodos Geopark Visitor Centre (troodos-geo.org)

In your plenary discuss who should pay for damage to the environment caused by business and industrial activities. Summarise the challenges which mineral extraction present.

Lesson 11 Renewable sources of energy

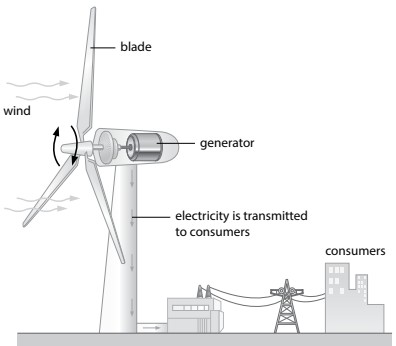
Textbook Section: 6.5, page 68.

Aim: To identify renewable sources of energy in Pakistan and evaluate the environmental credentials of different types of fuels.

In the preview remind the group that fossil fuels are not the only source of energy, and that their knowledge of climate change should make them aware that we need to urgently move towards renewable energy! Ask them to remind you why this is the case. Read the introductory chapter with the group and discuss how fast they think the country needs to move to transition to not using fossil fuels and what will make this a difficult transition.

Wind Energy

Activity 1



Read the text on wind energy on page 68 with the class and look at the 'wind farm' photograph. Ask them which part of the photo is showing the turbine (the top part behind the blade).

Talk with them about how a wind turbine operates- you might find it useful to have an image or images to help with this (as shown here, for example)

Point out that although wind turbines are seen as 'green energy' they each have a carbon footprint, like everything else (You might need to explain the idea of carbon footprint: the energy and resources needed to achieve something. Nothing is entirely green, but steps can be taken to 'offset' a carbon footprint).

Wikipedia explains Carbon Footprint as the"amount of gaseous emissions that are relevant to climate change and associated with human production or consumption activities."

Decide what you would like pupils to write in their notebooks, and provide additional information if necessary to provide further details of wind power projects across Pakistan.

Solar Energy

Activity 2

Next read the Solar Energy passage on page 68, and explain how solar power works.

A diagram might be helpful in doing this, for example

Present the groups with further information about solar power across Pakistan and set them some tasks to consolidate their knowledge of solar energy.

Optional Home Learning

You could set the 'Going Further' task towards the top of the page, giving a clear remit to pupils about what you would like them to do and how you would like them to report back.

In your plenary summarise what they have learned about wind and solar energy, and explain that next lesson they will study water powered electricity generation and the nuclear power industry.

Lesson 12 Hydro and Nuclear Energy Generation

Textbook Section: 6.5, page 69.

Aim: To study further sources of renewable energy.

In the preview explain that we will look at further two examples of renewable energy today: hydro-electricity and nuclear electricity

Water Energy

Activity 1

Read the hydro-electricity section at the top of page 69 and discuss the figures given about the total level of global hydroelectricity (HEP) generation and how much generation takes place in Pakistan. What can the group suggest about why the figure for HEP generation is fairly low for Pakistan currently?

Provide pupils with additional information about HEP in Pakistan and explain how water can be used to generate power.

Decide what you would like pupils to write into their notebooks.

Nuclear Energy

Activity 2

Read the remainder of page 69, and discuss why nuclear power is seen as a 'green' source of energy (as a renewable) by some, but criticised by others because the dangerous fuel rod waste in some reactor types takes ten years to cool, and remains a problem for over a ten thousand years.

Radioactive fuel rods: The silent threat | The Week Discuss with pupils whether power generation that continually creates dangerous waste that will be a killer in 10,000 years is really a renewable energy form.

Explain how nuclear generation works.

Optional Home Learning

The nuclear plants in Pakistan are collaborative projects, most recently with the Chinese government. You could ask pupils to think about why a foreign government is willing to help develop another country's infrastructure.

In your plenary explain that many people see nuclear power as a great benefit to humanity, despite its risks. You might remind the class that there are always risks, and that risk management is part of living. HEP, wind and solar generation are all good ways of generating power, but all also have costs.

Answers for the end of unit recall questions.

Section 1 Quiz Questions

Answers

1. A Minerals: are chemical compounds with a specific chemical and crystal structure (page 58).
   B. Petrology: is the study of origin, composition and nature of rocks (page 58).
   C. A Primary Industry: is one gathering raw materials, e.g. fishing, mining, mineral extraction (page 57).
   D. Secondary Industry: makes things from raw materials e.g. manufacturing, power generation (page 57).
   E. Fossil Fuels are carbon based fuels formed over millions of years by decaying plant and animal life under huge pressure (page 62).
2 students will draw and label in their notebooks.
3. Research based question.
4. Research-based question
5. Bituminous coal is hard, black and burns at high temperatures so is good for steel production; lignite coals are dustier, softer, and produce less heat but more Sulphur pollution (page 66).
6. The Oil and Gas Development Corporation oversees Pakistan's natural resources of fossil fuels (page 58).
7 Students will do the map activity.
8. Research-based question

Section 2 Multiple Choice Questions

1. B. Minerals can be in a solid, liquid or gaseous state (page 58).
2. Geologists classify the creation of rock in three forms: B. Igneous, metamorphic and sedimentary rocks (page 58).
3. Tertiary industries: A. Provide support services such as banking and insurance (page 57).
4. Quaternary industries C. provide high-tech information services such as cyber security and market research (page 57).
5. The largest deposits of coal are found: A. Under Tharparkar, Sindh (page 62).
6. Oil rigs under the sea are dangerous places to work because: B. In an emergency there are few chances to escape (page 65).

Opportunities for Longer Prose Responses, Debating and Extended Writing

1. Is Pakistan a 'mineral rich' country?
2. Does mineral extraction justify the investment?
3. How well should the law protect workers in extractive industries, and how harshly should it pursue company directors when there are accidents? (Debate)
4. Explain how long-wall and surface methods of mining operate.
5. Is it true that Pakistan 'has the wrong sort of coal'?
6. Why might renewable sources of power be the answer to Pakistan's energy deficit?
7. What factors impact on the demand for electricity and gas in Pakistan?
8. Is coal a greener, safer fuel than oil? (Debate)
9. Should government massively invest in the generation of renewable energy in the next decade? (Debate or essay/presentation)